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Robert S. Kerr Environmental Research Lab.
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ANNOTATED LITERATURE REFERENCES ON LAND TREATMENT OF HAZARDOUS WASTE

by

Jean Galegar
Environmental Research Institute
East Central Oklahoma State University
Ada, Oklahoma 74820

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Project Officer

Marvin L. Wood
Deputy Director
Robert S. Kerr Environmental Research Laboratory
Ada, Oklahoma 74820

ROBERT S. KERR ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
ADA, OKLAHOMA 74820

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The major environmental problem in the decade of the 1980's will be the safe disposal of hazardous and municipal wastes and residues.

Land treatment can be used to achieve specific effects through utilization of various management schemes. Through proper management of the land processes, soil characteristics may be altered to produce more productive soil, vegetation, and a cost-effective treatment process.

This publication represents one of a five part response to the grant on Land Treatment of Industrial Waste. This portion provides technical literature annotations of land treatment processes for chemical, hazardous, and industrial soild wastes. Since the concept of land treatment process is relatively new for industrial waste, information is widely scattered. Approximately eight hundred thirty publications, including material through the year 1982, have been reviewed and annotated in this report.

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FORWORD

EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws focused on air and water quality, solid waste management and the control of toxic substances, pesticides, noise, and radiation, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

The Robert S. Kerr Environmental Research Laboratory is the Agency's center of expertise for investigation of the soil and subsurface environment. Personnel at the laboratory are responsible for management of research programs to: (a) determine the fate, transport and transformation rates of pollutants in the soil, the unsaturated zone and the saturated zones of the subsurface environment; (b) define the processes to be used in characterizing the soil and subsurface environment as a receptor of pollutants; (c) develop techniques for predicting the effect of pollutants on ground water, soil and indigenous organisms; and (d) define and demonstrate the applicability and limitations of using natural processes, indigenous to the soil and subsurface enviornment, for the protection of this resource.

This project was initiated to prepare a master research plan for land treatment of hazardous waste and to provide annotations on technical literature related to this area. The literature found has been grouped into six major areas of interest consisting of site selection, design, operation and management, monitoring of land treatment systems, closure, and economics. Results indicate land treatment of selected organic waste to be an attractive alternative cost effective method. This compilation should be useful to those having a need to rapidly review available information in the areas identified above.

Clinton W. Hall

Clinton W. Hall
Director
Robert S. Kerr Environmental
Research Laboratory

ABSTRACT

The major environmental problem in the decade of the 1980's will be the safe disposal of hazardous and municipal wastes and residues.

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1. CRITERIA FOR THE SELECTION OF SITES FOR TREATMENT AND DISPOSAL OF HAZARDOUS WASTES

by

S. Morekas

Through the Resource Recovery Act of 1970, the United States EPA investigated a concept about centralized treatment and disposal sites for hazardous wastes. Studies conducted were from contractors and in-house investigations. Criteria for the selection of sites was developed by the contractor, Battelle Northwest Laboratories of Richland, Washington. Based on different reasons, two basic kinds of sites were located and identified as waste processing plant sites and long-term hazardous-waste disposal sites. Criteria for sites were based on earth sciences, transportation, ecology, and human environment and resource utilization. Most concern dealt with the location of the site based on processing and disposal information and also the size of the area to be studied. Information in accordance to the sites limited specific site identification to the county level (3,050 in the United States). By using such large site areas, it would be hard to identify specific sites. Instead, locations were chosen with general exsisting conditions that would be most or least suitable for site use.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 308-316.

2. CURRENTLY AVAILABLE GEOPHYSICAL METHODS FOR USE IN HAZARDOUS WASTE SITE INVESTIGATIONS

by

Roy B. Evans

There are three phases in a cost-effective waste-site assessment. These include: 1. preliminary site assessment utilizing air photos and site inspection; 2. geophysical surveys to find exact locations of buried wastes and to help define plumes of conductive contaminates in groundwater; 3. confirmation of groundwater contamination through monitoring well networks designed on the basis of the geophysical survey. Geophysical methods most useful in hazardous waste site investigations utilize metal detectors and magnetometers, ground-penetrating radar, electromagnetic induction (EM), resistivity surveys and seismic procedures.

This article contains the following twelve useful diagrams:

1. Simplified diagram of metal detector system.
2. Metal detector data over a trench with buried drums.
3. Simplified diagram of a magnetometer system.
4. Magnetometer data over a trench with buried drums.
5. Simplified diagram of ground-penetrating radar system.
6. Example of ground penetrating radar for locating buried drums.
7. Composites of four geophysical profiles over hazardous material burial sites.
8. Simplified diagram of Wenner Array for resistivity measurements.
9. Resistivity sounding.
10. Simplified diagram of electromagnetic system.
11. Conductivity data showing buried hazardous material.
12. Simplified block diagram of single trace seismic refraction system.

REFERENCE: Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, 89114, pp. 1-24.

3. LAND APPLICATION OF WASTE -- STATE OF THE ART

by

Kenneth R. Wright and Catherine Kraeger Rovey

Land application of waste water provides for two processes that complement each other: 1. the final treatment of waste-water, and 2. the reuse of nutrients. Recent Congressional legislation has made it essential to consider land treatment as a part of planning and designing new waste-water facilities. Three types of land treatment most often used are irrigation, overland flow, and rapid infiltration. Several elements to consider in selecting an appropriate site are soil conditions, geology, topography, climate, and proximity to the surface and subsurface water.

Due to its importance to maintaining the quality of human existence, the safeguarding against contamination of groundwater is of utmost importance in siting and designing land treatment systems. A broad list of elements to consider in protecting groundwater includes: 1. site selection; 2. proper pretreatment practices prior to application; 3. a consistent program of monitoring pretreatment and land application processes to ensure the safety of the environment.

Land treatment of waste-water and the use of municipal sludge on farm land for production is encouraged by Federal legislation. Sludge applied to farm land contains limited amounts of heavy metals, salts, and toxic substances. Sludge is, for the most part, stabilized to eliminate pathogens and reduce weight, volume, and odor before being applied.

Case studies are presented in this report to demonstrate the viability at the land treatment concept.

REFERENCE: Groundwater, Vol. 17, No. 1, 1979, pp. 47-61.

4. TERRAIN, LAND USE AND WASTE DRILLING FLUID DISPOSAL PROBLEMS, ARCTIC CANADA

by

Hugh M. French

In relation to drilling operations and the disposal of waste fluids, a survey was conducted in the Arctic Canada area. Some sixty abandoned well sites were examined, and approximately 25% of the sites experienced terrain disfunction due to the sumps and waste fluids. Under the Territorial Arctic Land Use Regulations, waste fluids are to be confined to underground sumps. To a large extent, these have been satisfactorily used. The summer months were the most critical times for use of the underground sumps. With more definite plans, careful operation techniques, and rigid application, the sump related trouble can be resolved. In some areas of high potential terrain and toxicity damage, other methods have been devised. A medium has been arranged between direct spillage or overland trucking and underground sumps in order to distribute disturbance of terrain, cost, and the effects of uncontrolled release of fluids.

REFERENCE: Arctic, Vol. 33, No. 4, December 1980, pp. 794-806.

5. COMPARISONS OF SOME FIELD METHODS FOR MEASURING THE HYDRAULIC CONDUCTIVITY OF SOILS

by

Mikko Sillanpää

Although the hydraulic conductivity of soils is difficult to determine, it is very important in agriculture and construction of all types. Field investigations using the piezometer, the tube, and the auger hole method have proven to be more reliable than laboratory investigations.

A new technique has been developed in determining the hydraulic conductivity using piezometer pipes and a soil auger. In using this new technique, conductivity values are slightly lower in more permeable soils and higher in less permeable soils, and the results are in relatively good agreement with earlier techniques.

This new method is particularly useful in areas where the water table is not present or is very low.

REFERENCE: Acta Agriculture Scandinavia, Vol. 9, 1959, pp. 59-68.

6. FIELD DETERMINATION OF HYDRAULIC CONDUCTIVITY ABOVE A WATER TABLE WITH THE DOUBLE-TUBE METHOD

by

Herman Bouwer

This double-tube method was tested in sand-box and field and was found to be of practical application. It was found to be a suitable tool for the (in situ) measuring of conductivity in soil not saturated previous to measurement. Field equipment and procedures are discussed in detail.

REFERENCE: Soil Science Society Proceedings, 1962, pp. 330-335.

For article on related subject see No. 1.

7. RELATIONSHIP OF EXCHANGEABLE NA PERCENTAGE AT DIFFERENT SOIL PH LEVELS TO HYDRAULIC CONDUCTIVITY

by

J. P. Martin et al.

A greater decrease in hydraulic conductivity is caused by the same amount of sodium in acid soil than in neutral or alkaline soil. The exchange capacity actually decreases in acid soil, therefore the same amount of sodium really represents a greater percentage of sodium saturation.

At sodium percentage of 5 to 15%, hydraulic conductivity in most nautral and alkaline soils was slightly greater than expected.

It is not apparent why hydraulic conductivity at intermediate sodium percentages increased at high acidity, but was at a minimum at moderate acidity.

REFERENCE: Soil Science Society Proceedings, 1964, pp. 620-622.

8. STREAM IMPROVEMENT THROUGH SPRAY DISPOSAL OF SULPHITE LIQUOR AT THE KIMBERLY-CLARK CORPORATION NIAGARA, WISCONSIN MILL

by

R. M. Billings

This report discussed using spray disposal as an alternate method for sulphite liquor. The paper presented a detailed description of the operation including selection of the area, construction and operation. The financial aspects were then briefly outlined. Because of the financial disadvantages, the system was only intended to be a temporary disposal system.

REFERENCE: Proceedings of the 23rd Industrial Waste Conference, Purdue University, Vol. 96, 1958, pp. 71-80.

9. AGGREGATE STABILITY

by

W. D. Kemper

Experimental procedures simulating actual field forces which disintegrate soil into smaller aggregates were conducted. The purpose was primarily to determine a method by which agregate stability could be measured. The report included use of various disrupting forces, equipment, and procedures. Coefficients obtained showed only small percentages of variation between duplicate samples. Soils having coarse textures showed somewhat larger variations between reproduced coefficients.

REFERENCE: Methods of Soil Analysis, Part I, 1965, pp. 511-519.

10. PARTICLE FRACTIONATION AND PARTICLE-SIZE ANALYSIS

by

Paul R. Day

This paper discussed the procedures and theories of soil particle fractionation and particle-size analysis. The procedures included fall under sieving and sedimentation categories. Sieving methods are used for more coarse structured particles. The pipette method and the hydrometer method operate on the principle of varying soil particle settling velocities. These two methods operate following a formula called Stoke's equation.

REFERENCE: Methods of Soil Analysis, Part I, 1965, pp. 545-567.

For article on related subject see No. 1.

11. BASE UNSATURATION AND PH IN RELATION TO SOIL TYPE

by

Adolf Mehlich

The percentage base unsaturation of different soil types was determined over a wide reaction range and various soil profiles. These base exchange colloids; montmorillonite, hydrous mica, beidellite, halloysite, kaolinite, indianaite, and humus acid; have base unsaturation-pH's that exhibit constant and specific characteristics for each mineral, though montmorillonite and hydrous mica appear to be very similar.

Soil base unsaturation-pH's were found to have similar relationships to those of known base exchange materials. Perhaps, this may enable the ascertainment of the presence of which base exchange mineral is predominant in a soil.

The base unsaturation-pH relationship is an expression of the specific nature of the base exchange mineral and is not influenced by either base exchange capacity or buffer activity. This relationship is useful in determining lime requirements of soils.

REFERENCE: Soil Science Society Proceedings, 1941, pp. 150-156.

For article on related subject see No. 9.

12. A BASELINE STUDY ON TRACE METAL ELUTION FROM DIVERSE SOIL TYPES

by

N. E. Korte et al.

Unwanted waste products are being distributed at the present time through the saturation of soils. An understanding of the transportation, saturation level, and sources involved have made an awareness of the need to understand the systems ecological continuity. A sample from ten soils was filtered with aluminum chlorate and iron chloride as a diluted solution. Continuing this process, hydrogen chlorine was also mixed with the chlorine solution and made to adjust to pH 3.0. Eight trace metals were examined as well as pH for the outflow of each. This was to determine the highest level of giving of the soils to the trace metal capacity from the soil solution. After correlating various soils for the dominating factor in the metal, it was the original metal which was found to be the controlling factor. Quite a level of manganese, cobalt, zinc, nickel, copper, and chromium were found more frequently than cadmium and lead in the soil filters. Two other contributing factors to the controlling system were the total amount of manganese and free iron oxides.

REFERENCE: Water, Air, and Soil Pollution, Vol. 5, 1975, pp. 149-156.

13. CROPPING SYSTEMS AND SOIL PROPERTIES

by

J. B. Page and C. J. Willard

Chemical and physical soil properties are the primary concerns for the continued productiveness of a cropping system. While the chemical properties of a soil are easily determined and altered by the use of the appropriate fertilizer, physical properties require extensive cropping procedures. Physical properties such as aggregation and pore space may be improved by the presence of adequate amounts of organic matter and by the use of procedures like crop rotation, tillage, and cropping with soil-building crops such as legumes and grasses. The significance of properties in a given soil is of major importance as it is not easily improved by any conventional means.

REFERENCE: Soil Science Society Proceedings, 1946, pp. 81-88.

14. DIFFERENTIAL RESPONSE OF CERTAIN SOIL TYPES TO APPLICATIONS OF CALCIUM ARSENATE

by

W. R. Paden

It has been found that under certain conditions arsenic may be toxic to some plants. Believing that significant results can be obtained by studying the growth response of certain crops in pot cultures in which varying amounts of calcium arsenate were added, a series of investigations was conducted with several soil types. The two types of soil selected were Davidson clay loam and Durham coarse sandy loam. It was found that there is a marked difference between two soil types with respect to the quanity of calcium arsenate required to produce injury to the growth of plants. The data indicates that calcium hydroxide may reduce appreciably the arsenic injury on Durham soil.

REFERENCE: Journal of American Society of Agronomy, Vol. 24, 1932, pp. 363-366.

15. DISTRIBUTION OF LITHIUM IN SOME SALT AFFECTED SOIL PROFILES

by

I. C. Gupta et al.

Four salt-affected soils were analysed for various properties. Results of these tests determined unusually high levels of lithium present, especially in surface soil samples. Two of the soils were found to be non-saline and non-sodic, while the remaining two were saline-sodic. In general, saline-sodic soils were found to contain higher levels of lithium than non-saline, non-sodic samples. These findings are significant in that plants suffering adverse affects from lithium toxicity are also known to be sensitive to sodium.

REFERENCE: Journal of the Indian Society of Soil Science, Vol. 22, No. 1, 1974, pp. 88-89.

16. EFFECT OF SURFACE APPLIED SULFURIC ACID ON WATER PENETRATION INTO DRY CALCAREOUS AND SODIC SOILS

by

T. A. Yahia et al.

This report studied the effects of sulfuric acid on the penetration of water in dry calcareous soils. Acid concentrations were applied to soils in various amounts. Generally, increased application rates increased penetration. Penetration also increased in soils with a higher exchangeable sodium percentage (ESP) rate. The applications of sulfuric acid were also found to be more effective for this purpose than gypsum, which has been commonly used in the past. Although the use of acid in areas with limited rainfall may cause various adverse effects, it is believed that these problems could be solved by using a band treatment method.

REFERENCE: Soil Science Society of American Proceedings, Vol. 39, 1975, pp. 1201-1204.

17. RECENT TRENDS IN THE USE OF THE LAND-CAPABILITY CLASSIFICATION

by

R. D. Hockensmith and J. G. Steele

This paper discussed several aspects of land capability classification. This type of classification should include characteristics of the land that limit its use, such as slope, low moisture supply, and soil texture. The classification includes the grouping of land area into units of similar physical characteristics. The report mentions the use of maps of the classified land and lists possible uses of this type of classification. The information gained from these procedures may then be used along with technical assistance to determine the proper management practices for a specific land plot.

REFERENCE: Soil Science Society Proceedings, 1949, pp. 383-388.

For article on related subject see No. 10.

18. THE STUDY OF COBALT STATUS OF SOILS IN ARKANSAS AND LOUISIANA USING THE BLACK GUM AS THE INDICATOR PLANT

by

Joe Kubota et al.

Leaves of the black gum were used as a test plant for areas of cobalt deficiency along the lower Atlantic Coastal Plain to Ground-Water Podzols. Cobalt contents of black gum from Ground-Water Podzols were lower than from Regosols; Low Humic-Gleys and Humic Gleys. Sandy Regosols occur in Arkansas and Louisiana, but Ground-Water Podzols do not. Soils at 29 sites ranged from sands to loamy sands to clays. Cobalt content ranged from 6 to 62 ppm. from lakeland soil and 23 to 410 ppm. from Shubuta soil; 56 and 53 ppm. were lowest values; 62 and 410 ppm. were highest values. Cobalt content relates to location of soil site. High cobalt values are not always related to drainage conditions. Values of 5 ppm. or less were absent due to absence of Ground-Water Podzols. Cobalt deficiency is related to the occurrence of Ground-Water Podzols along the lower Atlantic Coastal Plain.

REFERENCE: Soil Science Society Proceedings, 1960, pp. 527-528.

19. ADSORPTION AND DESORPTION PHENOMENA OF SULFATE IONS IN SOILS

by

Tsun Tien Chao et al.

This study contains results from equilibrium studies that are given to demonstrate the adsorption-desorption process involving sulfate. Of fifteen soils studied, four soils showed much higher adsorption of sulfate than the rest. Studies performed on retentive soils showed that sulfate adsorption was dependent on the concentration of the equilibrium solution. Results showed that adsorbed sulfate was in kinetic equilibrium with the sulfate solution. Definite anion exchange capacities or adsorption maxima was not present in sulfate-retentive soils. The study proposed that other mechanisms, in addition to anion exchange itself, are not implicated in the retainment of sulfate.

REFERENCE: Soil Science Society Proceedings, Vol. 1418, 1962, pp. 234-237.

20. ADSORPTION OF HYDROLYZABLE METAL IONS AT THE OXIDE-WATER INTERFACE

I. CO(II) ADSORPTION ON SIO_2 AND TIO_2 AS MODEL SYSTEMS

by

Robert O. James and Thomas W. Healy

Adsorption isotherms of aqueous cobalt in relation to silicon oxide and titanium oxide were developed by concentration and pH functions, isotherms of iron (III), chromium (III), and calcium (II); one silicon oxide was also developed. Their similarities and differences are discussed.

REFERENCE: Journal of Colloid and Interface Science, Vol. 40, No. 1, July 1972, pp. 42-52.

21. ADSORPTION OF HYDROLYZABLE METAL IONS AT THE OXIDE-WATER INTERFACE

II. CHARGE REVERSAL OF SIO_2 AND TIO_2 COLLIODS BY ADSORBED CO(II), LA(III), AND TH(IV) AS MODEL SYSTEMS

by

Robert O. James and Thomas W. Healy

In this second part of the paper, charge reversals in anionic colloids are discussed. It is noted that there are up to three charge reversals, (+ to -), (- to +), and back to (+ to -) at high pH. Several possible reasons for these reversals are given, then invalidated. New models for each of the three are developed.

REFERENCE: Journal of Colloid and Interface Science, Vol. 40, No. 1, July 1972, pp. 53-64.

22. ADSORPTION OF HYDROLYZABLE METAL IONS AT THE OXIDE-WATER INTERFACE

III. A THERMODYNAMIC MODEL OF ADSORPTION

by

Robert O. James and Thomas W. Healy

With evidence of papers (I) and (II), a new thermodynamic model was developed. This model takes into account these parameters: 1. metal (electrode)-ion interactions; 2. water electrode interactions; 3. ion-primary water interactions; 4. born energy contributions; 5. changing dielectric of solvent, which is then corrected if free energy is to be positive. This model is highly reliable and does not breakdown when compared with all the variables involved in the adsorption event.

REFERENCE: Journal of Colloid and Interface Science, Vol. 40, No. 1, July 1972, pp. 65-81.

23. AVAILABILITY OF IONS IN LIGHT SANDY SOILS AS AFFECTED BY SOIL REACTION

by

Michael Peech

This study looked at the effects of two soil factors, fixation and leaching, on ion availability in light sandy soils. Soil reaction was observed to control not only availability of natural insoluble nutrients, but fixation and leaching as well. Liming these soils to raise the pH levels was found to both reduce leaching of cations and provide for available calcium and magnesium. This in turn would conserve the more valuable fertilizer constituents. However, overliming was found to make other elements unavailable, such as zinc and copper, even at low pH values.

REFERENCE: Soil Science, Vol. 51, 1941, pp. 473-486.

24. DIFFUSION AND NEMATODE CONTROL BY 1,2-DIBROMEOTHANE, 1,3-DICHLOROPROPENE, AND 1,2-DIBROMO-3-CHLOROPROPANE IN SOIL

by

C. R. Youngson and C. A. I. Goring

1,2-dibromeothane, 1,3-dichloropropene, and 1,2-dibromo-3-chloropropane were tested as fumigants for the control of root-knot nematodes in soils. The basic toxicity of 1,3-dichloropropene was found to be highest among the three chemicals studied. Nematode control was highest when two injection depths were used as opposed to applying the substance at only one depth. The addition of manure and fresh plant material significantly decreased nematode control by the fumigants. In some cases, the toxicity of the substances was also affected by the temperature level.

REFERENCE: Soil Science, Vol. 93, 1962, pp. 306-316.

25. DISTRIBUTION OF NONIONIC SURFACTANT IN SOIL COLUMNS FOLLOWING APPLICATION AND LEACHING

by

W. W. Miller and J. Letey

This experiment determined the distribution of Soil Penetrant in both a wettable and water repellant soil. The surfactant was leached farther through the wettable soil and was distributed more evenly throughout the soil column. Calculations from a proposed model correlated adequately with experimental data. Distribution of Soil Penetrant was closely related to specific adsorptive characteristics.

REFERENCE: Soil Science Society of American Proceedings, Vol. 39, 1975, pp. 17-22.

26. EFFECT OF PH ON ADSORPTION OF ARSENIC AND SELENIUM FROM LANDFILL LEACHATE BY CLAY MINERALS

by

R. R. Frost and R. A. Griffin

Arsenic (VI), Arsenic (III), and Selenium (IV) adsorption was shown to be highly dependent upon the pH of the soil. Results indicate that Arsenic and Selenium are very mobile through pure clay beds, and contamination of ground water could easily occur due to this mobility in leachate.

REFERENCE: Soil Science Society of American Proceedings, Vol. 41, 1977, pp. 53-57.

27. EFFECT OF PH ON EXCHANGE-ADSORPTION OR PRECIPITATION OF LEAD FROM LANDFILL LEACHATES BY CLAY MINERALS

by

Robert A. Griffin and Neil F. Shimp

This study examined the effects of leachate and pH fluctuation on the ability of two clays to remove lead from solution. Leachate significantly reduced the lead removal as did a lower pH factor. the lead solution moved much more freely through kaolinite clay, and lead was removed to a much greater degree in the montmorillonite clay. Other smaller factors considered included: 1. the formation of lead-organic complexes, 2. dispersion, and 3. diffusion. Data concluded that montmorillonite clay needs to be present in thin layers to successfully remove lead under normal circumstances.

REFERENCE: Environmental Science and Technology, Vol. 10, No. 3, 1976, pp. 1256-1261.

28. FACTORS AFFECTING MOLYBDENUM AVAILABILITY IN SOILS

by

E. B. Davies

Total molybdenum in soils and rocks is uniformly distributed due to the ability to replace a large amount of similar ionic elements. These are found in the radius of the latice rock-forming minerals. Results of tests on molybdenum found in soils and rocks range from 2-4 ppm, depending on where the soil is tested. Soil testing has ranged from the low tundra in the Nelson province of New Zealand, to the mountain tundra of the USSR. The content of molybdenum in soils cannot be seen in well supplied soils. A good example of this is ironstone soil. Molybdenum was first known for its abnormalities. Research was done on clover and its responses in South Australian pasture to woodash, which was unsatisfactory. In doing research, excess molybdenum in animals and molybdenum deficiency in plants helped point out extremes in either case formed from the symptoms. Molybdenum was treated for content levels in herbage to see whether toxic forms were found in stock or available plants. An arbitrary crop consisting of 2 tons from 2 million pounds of soil per acre was tested for a variety of twenty-four soils. Molybdenum does exsist, but the content varies according to age, species, and the past of the plant. Excess molybdenum present in herbage was chemically tested for soil deficiencies. The soils varied from 0.04-0.12 ppm. The oxalate method gave figures ranging from 0.20-0.70 ppm. Six trials on Canterbury soils showed no connection with molybdenum content in clovers or grasses in sulfate-plus-phosphate plots and "available" molybdenum. General comparison of pasture analyses shows that other factors are involved in the molybdenum uptake. Alkaline soils are prone to have high herbage molybdenum. Soils less likely to have contents of molybdenum are calcareous sands and granites. Soils with low oxalate-solubles and low in phosphates have produced pastures above normal. Likewise, soils with high oxalate-solubles and slight acid have produced pasture levels below 1 ppm.

REFERENCE: Soil Sciences, Vol. 81, 1956, pp. 209-221.

29. FATE OF ARSENICALS IN DIFFERENT ENVIRONMENTAL SUBSTRATES

by

E. A. Woolson

Arsenicals are, unless added specifically, in equilibrium concentration within soils, water, and sediments. Transportation and transformation occur in each of these substrates, but only the end results are known. Nothing is known about the rates of these events, or just what causes a specific reaction in the environment. More research is suggested in the qualitative analysis of arsenical transportation and transformation to determine what is taking place between the ends of an event. This will need to take place before more definite conclusions can be made.

REFERENCE: Environmental Health Perspectives, Vol. 19, 1977, pp. 73-81.

30. FATE OF INORGANIC FORMS OF N AND SALT FROM LAND-DISPOSED MANURES FROM DAIRIES

by

D. C. Adriano et al.

Analyses conducted on several soils, which had undergone dairy waste disposal, revealed concentrations of nitrate-nitrogen which would eventually contaminate the groundwater. Estimations were also made as to the amount of salt waste produced by dairy cattle. Controlling the nitrate-nitrogen level may be accomplished by either reducing cattle populations or by increasing the ammonia volatilization from waste before applying it to the soil.

REFERENCE: Livestock Waste Management, 1971, pp. 243-246.

31. AN IMPROVED BIOASSAY TECHNIQUE USED IN SOLID WASTE LEACHATE PHYTOTOXICITY RESEARCH

by

Nelson T. Edwards and Balie M. Ross-Todd

A vertical seed germination system was set up for use in a short-term phytotoxicity test of potentially hazardous chemicals. The apparatus was made for the purpose of straight root growth from seedlings. This eliminates crooked or coiled radicles encountered when seedlings are grown. Radish and sorghum seedlings that are grown in this appartus can be measured 1 x 10 the time required.

REFERENCE: Environmental and Experimental Botany, Vol. 20, 1980, pp. 31-38.

32. THE LEACHING OF SOME HALOGENATED ORGANIC COMPOUNDS FROM DOMESTIC WASTE

by

C. J. Jones et al.

This experiment studied the leaching of several halogenated organic compounds from domestic wastes. The leachate concentrations were found to be reduced initially by evaporation and adsorption of the domestic waste. The amount of organic compounds detected in leachates was primarily determined by the solubility of the compound. Although varying under different conditions and with differing compounds, adsorption was determined to be somewhat effective for reducing the concentrations of organic compounds in leachates.

REFERENCE: Journal of Hazardous Materials, Vol. 2, 1977-1978, pp. 227-233.

33. LEACHING RATES OF HEAVY IONS IN FOREST SOIL

by

Germund Tyler

Two purely organic spruce forest soils were studied for leachability of manganese, zinc, cadmium, nickel, vanadium, copper, chromium and lead--one control soil and a similar soil polluted heavily by copper and zinc from a brass foundry in southern Sweden. Rainwater, acidified to pH 4.2, 3.2, and 2.8, was used in the experiment. Comparison of the control soil and the polluted soil treated with rainwater of pH 4.2 showed that residence times of the elements above, excluding vanadium and chromium, decreased with pH of rainwater.

REFERENCE: Water, Air, and Soil Pollution, Vol. 9, No. 2, 1978, pp. 137-148.

34. MANAGEMENT OF GAS AND LEACHATE IN LANDFILLS PROCEEDINGS OF 3RD ANNUAL MUNICIPAL SEWAGE WASTEWATER RESEARCH SYMPOSIUM

by

Shanka K. Bamerji (editor)

The latest research information on management of gases and leachates in landfills was presented at this symposium. Topics included gas and leachate formation, collection, and management. Papers were presented by these research agencies: 1. the Solid and Hazardous Waste Disposal Division, 2. Municipal Environmental Research Laboratory, and 3. Research of Exsisting Sanitary Landfills. Selected papers from other organizations were included because of their close relation to the topics of the symposium.

REFERENCE: EPA-600/9-77-026, PB 272-594, 1977, pp. 1-299.

35. PESTICIDE MOBILITY IN SOILS
I. PARAMETERS OF THIN-LAYER CHROMATOGRAPHY

by

Charles S. Helling

The recently developed techniques of soil thin-layer chromatography (TLC) was used to study pesticide movement. The adsorbent phase of soil is developed with water using techniques like those of conventional TLC.

Mobility was insensitive to the following characteristics: removal of coarse or medium sands, movement distance, soil layer thickness, temperature, and sample size. Water flux was modified by physical and solvent amendment methods. The mobilities of 2,4-D and atrazine decreased substantially in a solution of less than 0.5M sodium chloride and the decrease of paraquat then followed. Distance to the wetting front on soil TLC plates was linearly related to the square root of time.

Three methods of studying radioactive pesticide movement were compared--autoradiography and radiochromatogram scanning and zonal extraction.

REFERENCE: Soil Science Society of American Proceedings, Vol. 35, 1971, pp. 732-737.

36. PREPARATION OF POROUS CERMAIC CUPS TO BE USED FOR EXTRACTION OF SOIL WATER HAVING LOW SOLUTE CONCENTRATIONS

by

B. L. Grover and R. E. Lamborn

Excessive amounts of calcium, sodium, and potassium were contributed to solutions by the ceramic cups of soil moisture access tubes, and substantial amounts of phosphorus were absorbed from solutions containing phosphorus when these solutions were drawn through the access tube. Contamination of sodium and potassium and adsorption of phosphorus were reduced to acceptable levels by leaching the cups with 1N of hydrochloric acid. Calcium continued to contaminate solutions, but levels of calcium were greatly reduced.

REFERENCE: Soil Science Society of American Proceedings, Vol. 34, 1970, pp. 706-708.

37. RATES OF LEACHING OF RADIUM FROM CONTAMINATED SOIL: AN EXPERIMENTAL INVESTIGATION OF RADIUM BEARING SOILS FROM PORT HOPE, ONTARIO

by

Jatin S. Nathwani and Colin R. Phillips

Small-scale static leach tests were used to gain information about the mobility and leaching characteristics of radium in the contaminated soils of Port Hope, Ontario. This contamination is a result of uranium mill tailing, with its naturally occurring counter part radium-226, used mistakenly through the town as harmless fill. The studies revealed finer soils provide higher attenuation capacities and lower leaching rates; conversely, acidic leachant increases the leaching rate and enhances radium mobility.

REFERENCE: Water, Air, and Soil Pollution, Vol. 9, No. 4, 1978, pp. 453-465.

38. THE SIMULTANEOUS EFFECT OF PH AND CHLORIDE CONCENTRATIONS UPON MERCURY(II) AS A POLLUTANT

by

H. C. H. Hahne and W. Kroontje

This experiment determined the effect of chloride concentrations and a wide range of pH values on mercury(II) in aquatic systems. Chloride complexes were found to effectively compete with the hydroxy complexes of mercury(II). This may be the major factor associated to the mobilization of the mercury(II). At lower pH values, conditions were sufficient for all mercury(II) to be in combined form while when higher pH values are considered, complete mobilization depends on chloride and mercury(II) concentrations present. A portion of the experiment, which equilibrated montmorillonite, illite and koalinite with mercury(II) in clay soils, revealed little if any adsorption.

REFERENCE: Soil Science Society of American Proceedings, Vol. 37, 1973, pp. 838-843.

39. SOIL ATTENUATIVE CAPACITY AND TRANSPORT POTENTIAL OF SOLID WASTE LEACHATES

by

Aaron A. Jennings et al.

This report studied the attenuations associated with a certain type of soil/leachate interaction. Leachates released in the experiments using Barr sand would seriously affect groundwater quality. Oxygen demand, taste and odor problems, ionic strength, and contamination by infectious agents were some problems which could be encountered. Because attenuation may result in only the temporary fixation of leachates, severe hazards may still be encountered. In a modified landfill facility, it was confirmed that attenuation failed to prevent rapid movement of the leachate. The possibility of co-disposal of wastes shows no advantages in changing the endangerment evaluation. Column studies done on attenuations provided the most useful information including attenuation capacity changes with time, reversability, and transport model calibrations.

REFERENCE: Proceedings of the 33rd Industrial Waste Conference, Purdue University, 1979, pp. 255-262.

40. SOIL MODIFICATION TO MINIMIZE MOVEMENT IN POLLUTANTS FROM SOLID WASTE OPERATIONS

by

Wallace H. Fuller

All aspects of soil characteristics are surveyed then related to control of pollutant movement out of solid waste sites. Soil combination and soil engineering are the two areas of control covered in this paper. Examples of these waste treatment/utilization systems are soil liners, clay liners, native soil liners, soil plus other material, soil covers, soil trenches, soil layering, burials, area methods, biological treatment, oxidation ponds, lagoons, land farming, sludges, cannery waste, composts, municipal-solid waste, oil and oil sludges.

REFERENCE: CRC Critical Reviews in Environmental Control, 1980, pp. 213-270.

41. VACUUM EXTRACTORS TO ASSESS DEEP PERCOLATION LOSSES AND CHEMICAL CONSTITUENTS OF SOIL WATER

by

H. R. Duke and H. R. Haise

The described extractor takes samples from a large soil surface area, interferes only slightly with plant roots, and establishes the exact area from which the water sample was taken. Convergence is kept to a minimum by flexible control of the applied suction.

REFERENCE: Soil Science Society of American Proceedings, Vol. 37, 1973, pp. 963-964.

42. ACTION OF SYNTHETIC DETERGENTS ON THE METABOLISM OF BACTERIA

by

Zelma Baker et al.

This study showed that synthetic detergents and wetting agents effect respiration and glycolysis in gram-positive and gram-negative microorganisms in these ways: 1. all cationic detergents studied were very effective inhibitors of bacterial metabolism; 2. gram-positive and gram-negative types are equally sensitive to cationic detergent action. All anionic detergents were selectively inhibitive of gram-positive types. Hydrogen ion concentration, of both detergents, influences the inhibitive action. Maximum inhibitory action by cationic detergents was displayed in the alkaline range, anionic in the acid range. Straight chain alkyl sulfates and sulfoacetates display maximum inhibitation by the 12, 14, and 16 carbon compounds; cationic detergents can inhibit bacterial metabolism comparable to inhibitory action displayed by quaternary ammonium compounds. At low concentrations, anionic detergents can stimulate bacterial metabolism.

REFERENCE: Journal of Experimental Medicine, Vol. 73, 1941, pp. 249-271.

43. ADSORPTION OF ORGANIC HERBICIDES BY MONTMORILLONITE: ROLE OF PH AND CHEMICAL CHARACTER OF ADSORBATE

by

G. W. Bailey et al.

The objective of this experiment was to determine the role of pH and the chemical character of the adsorbate on the adsorption of organic compounds by clay samples. One type of clay sample was strongly acidic, while the other type had a near neutral pH. Adsorption occurred much more readily to the acid clay. Conditions which affected adsorption were as follows: degree of water solubility, dissociation constant of the adsorbate, pH of the clay, and surface acidity. The report also mentioned the possible adsorption mechanisms for acidic organic compounds.

REFERENCE: Soil Science Society of American Proceedings, Vol. 32, 1968, pp. 222-234.

44. ANAEROBIC LAGOON PRETREATMENT OF PETROCHEMICAL WASTES

by

Joseph C. Hovious et al.

Petrochemical waste treatment by means of anaerobic lagoon pretreatment was looked into. It was found that by correlating volumetric-organic loading and temperature, design specifics can be generated for whatever lagoon performance is desired with biochemical oxygen demand and chemical oxygen demand removal as the deciding factors.

REFERENCE: Journal WPCF, Vol. 45, No. 1, 1973, pp. 71-84.

45. ASPECTS OF WASTE DISPOSAL ON AGRICULTURE LAND

by

S. M. King and S. A. Hart

It is an accepted fact that certain lands should be designated only for disposal of wastes. Land has historically been the store house of various amounts of wastes. In addition, land should be benefited, and a buildup of toxic materials should not be allowed to happen. It is true; soil acts as an incinerator of biological materials and as a living filter. Although very few of the allotted 100 acres across the world are being used as such filters or bio-incinerators of concentrations of wastes. It has been proposed that if only a small part of the hectarage be used for disposal, it would later be beneficial as soil filters and incinerators.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 332-339.

46. ASPERGILLUS NIDULANS: SYSTEMS AND RESULTS OF TESTS FOR INDUCTION OF MITOTIC SEGREGATION AND MUTATION

II. HAPLOID ASSAY SYSTEMS AND OVERALL RESPONSE OF ALL SYSTEMS

by

Barry R. Scott et al.

Using available disclosed literature, Aspergillus screening systems were evaluated according to relevant information found in 58 of the 179 references collected. The 58 were divided into two groups. Group one papers were analyzed for chemical effects on mitotic segregation in Aspergillus. Group two deals with Haploid Aspergillus response to a variety of agents. The overall conclusion was that the simple haploid mutational system and conjunctive use of diploid analysis creates a reliable screening and in-depth analysis of genotoxic chemicals on Aspergillus nidulans.

REFERENCE: Mutation Research, Vol. 98, 1982, pp. 49-94.

47. BIOLOGICAL NITRIFICATION INHIBITION SCREENING PROCEDURES FOR INDUSTRIAL WASTEWATERS

by

Enos L. Stover

Two types of experiments were conducted to assess the nitrification inhibition of three industrial wastewaters on samples of nitrifying organisms. The experiments produced a list of major factors found to affect biological nitrification. These factors were in agreement with previously gathered data from other studies showing ammonia/nitrogen load, BOD load, food/organism ratio, sludge age, wastewater and liquor pH, temperature, hydraulic detention time, and toxicity to be the most significant components in affecting nitrification inhibition. These two procedures, when accurately conducted, can produce accurate data for analyzing nitrification rates of biological treatment systems.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 887-895.

For articles on related subject see Nos. 11 and 23.

48. BIOLOGICAL TREATMENT OF WINERY STILLAGE

by

E. D. Schroeder et al.

This report discussed the use of biological methods for the treatment of winery stillage waste. Aerobic methods appeared to be the most desirable. An important factor for an efficient system of this type is adequate solids removal by methods such as anaerobic digestion. The report gives the steps and procedures for this system and mentions some of the problems encountered. Effluents from this system may be used for irrigation purposes or discharged into municipal sewers. Irrigation procedures should be accompanied by an apparatus to detect water movement through the soil and determine any potential hazards.

REFERENCE: Food Processing Waste Management Proceedings, Cornell Agriculture Waste Management Conference, 1973, pp. 8-20.

49. BORON AVAILABILITY AS INFLUENCED BY APPLICATION OF FLY ASH TO SOIL

by

C. O. Plank and D. C. Martens

For a three year period, fly ash application and boron availability in soil were tested for relationships under field conditions. From the fly ash samples, two contained 232 and 370 parts per million of boron totally. In application of either fly ash sample, the incorporation into a Tatum silt loam increased alfalfa. By removal of boron, the yield increased. Initial boron uptake in fly ash has availability, but lowers with time. Correlation and decreasing data offers results that hot-water-soluble boron extractions could possibly be utilized to predict plants with boron present in fly ash-soil mixtures.

REFERENCE: Soil Science Society of American Proceedings, Vol. 38, 1974, pp. 974-977.

50. CANNERY WASTE DISPOSAL BY GERBER PRODUCTS

by

Max R. Dietz and Ray C. Frodey

Disposal of cannery wastes by Gerber products became an acute problem for Gerber and the city of Fremont, Michigan around 1946. In 1949, Gerber set out to build a disposal system independent of the municipal waste disposal system. The first attempts were inefficient and costly. Gerber went to spray irrigation after extensive research on other canneries. Preliminary studies involved soil maps, drainage, elevations, and soil types. Gerber chose an area under cultivation with cover crops of alfalfa, wheat, oats, weeds, and June grass. Lateral lines were layed at lengths of 560 feet and at 60 foot intervals. Each line had fourteen spray nozzles. The pumping system had the capacity to handle 167,000 gallons per day. The cover crop provides advantages such as dispersing of the water before it reaches the ground, take-up of some water from the ground itself, collecting of some solids from the water before it reaches the ground, root systems provide channels for water to infiltrate, preventing stratification of surface soil, affording more area for evaporation and prevention of erosion of the soil. The nature of water to date has caused no apparent damage to any cover crops. Solid wastes are screened off and are fed to hogs. These methods of disposal are economically feasible as long as the plant is within close proximity to the disposal area.

REFERENCE: Compost Science, Vol. 6, Autumn 1960, pp. 22-25.

51. CHEMICAL COMPOSITION OF SEWAGE SLUDGES AND ANALYSIS OF THEIR POTENTIAL USE AS FERTILIZERS

by

L. E. Sommers

An analysis was done on a number of different sewage sludges to determine the various concentrations of its constituents. Levels of nitrogen, phosphorus, and potassium were approximately the same in most sludges while levels of lead, zinc, copper, nickel, and cadmium varied considerably. The use of each of these sewage sludges for fertilizer purposes should be preceeded by a detailed analysis of the substance to detect any hazardous trace elements.

REFERENCE: Journal Environmental Quality, Vol. 6, No. 2, 1977, pp. 225-232.

52. COAL GASIFICATION WASTE DETOXIFICATION VIA LAND TREATMENT

by

Michael R. Overcash et al.

This report discusses the disposal of coal gasification wastes, primarily polycyclic and heterocycle aromatic compounds by land treatment methods. Decomposition studies concluded that this method of treatment would be effective on practically all wastes, effluents, and sludges produced from gasification procedures. Land treatment has the advantage of providing direct treatment of waste by-products as well as being an economical technique.

REFERENCE: Proceedings ASCE Division Environmental Engineers Specialty Conference, August 10, 1981, pp. 468-478.

53. COMPARATIVE EFFECTS OF IONIZING RADIATION AND TWO GASEOUS CHEMICAL MUTAGENS ON SOMATIC MUTATION INDUCTION IN ONE MUTABLE AND TWO NON-MUTABLE CLONES OF TRADESCANTIA

by

C. H. Nauman et al.

Mutable clone 0106 of tradescantia, its parent clone 02, and clone 4430, a hybrid of T. subacaulis and T. hirsutiflora, which was not a relative of either the 0106 or 02 used, were utilized to determine dose response curves from X-irradiation, exposure to eithyl methanesulfonate and exposure to 1,2-dibromoethane. The response curves for the mutagens show similar characteristice--exponential rises followed by down turn saturation. However, the sensitivites of the three clones to the three mutagens were not congruent.

REFERENCE: Mutation Research, Vol. 38, 1976, pp. 53-70.

54. A COMPARISON OF BLAST FURNACE SLAG AND LIMESTONE AS A SOIL AMENDMENT

by

Garth W. Volk et al.

A comparative study was made on the yield of mixed hays, alfalfa and corn as affected by the granulated and air-cooled blast furnace slags and limesontes. The test was to be conducted for the influence of fineness, soil reaction, and rate of application. A combined experiment of both lab and field work was done on their separate soils--Canfield, Meig, and Mahoning. Between the crop yields and finer grades of dolomitic limestone and air-cooled slag, there was no significant difference. This was a result of high surface exposure. Granulated slag appeared better than air-cooled slag or limestone. The air-cooled slag and limestone were effective in higher crop yields when applied in equal proportions. In the greenhouse experiment, both limestone and granulated slag had more of an effect than the air-cooled slag. Crop response with applied slag was not predictable from the soil reactions alone. In all areas of testing with carbon dioxide, the air-cooled slag was less effective. The relationship between calcium and liming material could therefore correct soil acidity.

REFERENCE: Research Bulletin 708, Ohio Agricultural Experiment Station, 1952, pp. 3-19.

55. CONVERSION OF SLUDGES INTO "TOPSOILS" BY EARTHWORMS

by

Myron J. Mitchell et al.

The role of Eisenia foetida and Lumbricus terrestris in altering the physical and chemical properties of four different sludge types was investigated.

While some sludges are initially toxic to earthworms, microworms, bacteria and fungi reduce this toxicity to safe levels. The physical breakdown of sludge is enhanced when converted to egesta as the surface area is increased and quicker breakdown occurs by microbial decomposers.

Earthworms may increase the humic acid content in sludges in the initial stages of decomposition.

Earthworms may also reduce human microbial pathogens such as Salmonella typhimurium.

Earthworms reduce the quantity of sludge, but more importantly they improve the chemical, physical, and biological properties of soil.

56. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE SOAP AND DETERGENT

by

Effluent Guidelines Division of EPA

This document presents the findings of an extensive study of the soap and detergent manufacturing industry by Colin A. Houston and Associates for the Environmental Protection Agency for the purpose of developing effluent limitations guidelines, Federal standards of performance, and pretreatment standards for the industry to implement Sections 304, 306, and 307 of the Federal Water Pollution Control Act Amendments of 1972.

Effluent limitations guidelines recommended herein set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through application of the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. The Standards of performance for new sources recommended herein set the degree of effluent reduction which is achievable through application of the best available demonstration control technology, processes, operating methods, or other alternatives.

The development of data and recommendations in the document relate to the nineteen subcategories into which the industry was divided on the basis of raw waste loads and appropriate control and treatment technology. Separate effluent limitations are proposed for each subcategory on the basis of raw waste load control and end-of-pipe treatment achievable by suggested model systems.

Supportive data and rationales for development of the proposed effluent limitations guidelines and standards of performance are contained in this report. Potential approaches for achieving the limitations levels and their associated costs are discussed.

REFERENCE: EPA, 440/1-74-018-a, April 1974, pp. 1-202.

57. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE TIRE AND SYNTHETIC SEGMENT OF THE RUBBER PROCESSING

by

Effluent Guidelines Division

This document presents the findings of a study of the tire and inner tube and synthetic rubber segments of the rubber processing industry by Roy F. Weston, Inc. for the Environmental Protection Agency, for the purpose of developing effluent limitation guidelines, Federal standards of performance, and pretreatment standards for the industry, to implement Sections 304, 306, and 307 of the Federal Water Pollution Control Act, as amended (33 USC 1251, 1314, and 1316; 86 Stat 816).

Effluent limitation guidelines contained herein set forth the degree of effluent reduction attainable through the application of the best practicable control technology currently available and the degree of effluent reduction attainable through the application of the best available technology economically achievable, which must be achieved by existing point sources by July 1, 1977 and July 1, 1983, respectively. The Standards of Performance for new sources contained herein set forth the degree of effluent reduction which is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives.

The development of data and recommendations in the document relate to the tire and inner tube and synthetic rubber segments of the rubber processing industry. These two segments are further divided into four subcategories on the basis of the characteristics of the manufacturing processes involved. Separate effluent limitations were developed for each category on the basis of the level of raw waste load as well as on the degree of treatment achievable by suggested model systems. These systems include both biological and physical/chemical treatment, and for the synthetic rubber subcategories treatment of the secondary effluent by carbon adsorption.

Supportive data and the rationale for development of the proposed effluent limitation guidelines and standards of performance are contained in this document.

REFERENCE: EPA, 440/1-74-013-a, February 1974, All pages.

58. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS LEATHER TANNING AND FINISHING

by

Effluent Guidelines Division

The leather tanning and finishing industry characteristically is family-owned, not very progressive or profitable, and dominated by small plants employing less than 100 people. There are an estimated 188 leather tanning and finishing plants in the United States today comprised of 170 dischargers to publicly owned treatment works (indirect dischargers) and 18 dischargers to waters of the U.S. (direct dischargers). Total industry flow is approximately 52 million gallons daily (MGD), of which 47 MGD are discharged to POTWs and 5 MGD are discharged directly to navigable waters.

For the purpose of establishing wastewater effluent limitations guidelines and standards of performance for new sources, the Leather Tanning and Finishing Point Source Category has been subcategorized as follows:

1. Hair Pulp-Chrome Tan-Retan-Wet Finish
2. Hair Save-Chrome Tan-Retan-Wet Finish
3. Hair Save-Nonchrome Tan-Retan-Wet Finish
4. Retan-Wet Finish
5. No Beamhouse
6. Through-the-Blue
7. Shearling.

The primary criteria for subcategorizing the leather tanning and finishing industry were the type of condition of animal hide processed, method of hair removal, type of tanning agent used, and extent of finishing performed. Plant size, age, and location, wastewater characteristics, and water usage were also considered.

The most significant pollutants and pollutant parameters detected in the industry's wastes in terms of occurrence and concentration include: the conventional and proposed conventional pollutants BOD$^{\underline{5}}$, TSS, pH, COD, and oil and grease; and the nonconventional pollutants ammonia, total Kjeldahl nitrogen (TKN), and sulfide. The following toxic pollutants were found in treated effluents at more than two plants above the nominal limits of detection:

2,4,6-trichlorophenol
chloroform
1,2-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
methylene chloride (dichloromethane)
naphthalene
pentachlorophenol
phenol
bis (2-ethylhexyl) phthalate
toluene
chromium
copper
cyanide
lead
nickel
zinc

A total of 37 toxic pollutants were detected in raw waste discharges of which 17 were also detected in biologically treated effluents.

The Agency concludes that the best practicable control technology currently available (BPT) is based upon the performance of primary treatment (coagulation-sedimentation) and "secondary" biological treatment (extended aeration activated sludge) as practiced at plant No. 47 (subcategory No. 3) and at the Berwick Maine POTW which treats more than 90 percent tannery wastewater (subcategory No. 4). Treatment systems at plant No. 253 (subcategory No. 7), a plant in the Netherlands (subcategory No. 1), and the Hartland, Maine POTW treating 90 percent tannery wastewater (subcategory No. 1) support this conclusion because the performance of the systems equaled or surpassed the performance of plant No. 47 and the Berwick POTW. The Agency also concludes that the balance of the plants with direct discharge have inadequate treatment systems and must be upgraded to achieve effluent limitations based upon BPT performance transferred from subcategories within the leather tanning and finishing industry.

The pollutant parameters regulated by the proposed best practicable technology (BPT) are BOD$^{\underline{5}}$, TSS, oil and grease, (total) chromium, and pH.

The Agency concludes that the best available technology economically achievable (BAT) builds on BPT technology with in-plant control, and pretreatment and upgraded biological treatment by powdered activated carbon addition, and multi-media filtration. Plant No. 247 (now closed) employed physical/chemical treatment to achieve an effluent quality far better than required by BAT. The activated sludge system at plant No. 253 has achieved BAT effluent quality for some of the regulated pollutant parameters for substantial periods of time. The balance of the plants with direct discharge have inadequate treatment systems in place and technology and performance transfer is necessary to achieve BAT effluent limitations.

The pollutants regulated by the proposed best available technology economically achievable (BAT) and the new source performance standards (NSPS) are BOD$^{\underline{5}}$, COD, TSS, oil and grease, TKN, ammonia, sulfide and pH, and the toxic pollutants (total) chromium and (total) phenol. No effluent limitations have been proposed for any other toxic pollutants. The control of toxics other than chromium and phenol, which are found in significant concentrations in tannery wastewater, will be regulated by placing numerical limitations on "indicator" pollutants, including BOD$^{\underline{5}}$, COD, TSS, oil and grease, TKN, ammonia, (total) chromium, and (total) phenol. EPA has concluded from available data that when the indicator pollutants are controlled, the concentrations of toxic pollutants are significantly lower than when the indicator pollutants were present in high concentrations. The Agency concludes from this data that control of the "indicator" pollutants is necessary to ensure the control of toxic pollutants.

The Agency concludes that plants with indirect discharge contribute substantial quantities of organic compounds and heavy metals, the most important of which is chromium, to the contamination of large quantities of POTW sludges. In addition, the Agency concludes that the high concentrations of nitrogen (particulary ammonia) in raw wastewater pass through POTW largely untreated, and that the high concentrations of hydrogen sulfide in raw wastewaters can and do cause severe odor and health hazard problems. In-plant controls, pretreatment of segregated streams, and primary treatment of combined streams is the technology basis of pretreatment standards for existing sources (PSES) to control the discharge of toxic pollutants, and ammonia and sulfides. This level of control will increase POTWs sludge disposal alternatives, improve POTW effluent quality, and essentially eliminate odor and health hazard problems. The Agency concludes that this level of control recognizes limitations on existing interior plant space and adjacent land. Most plants will find it necessary to install a large portion of these in-plant controls and pretreatment technologies to achieve PSES limitations.

The Agency concludes that pretreatment standards for new sources (PSNS) should be based upon the same technology used for PSES plus physical/chemical treatment to achieve BAT levels of control for toxic pollutants. The Agency concluded this level of control would be necessary because POTW effluent quality which incorporates PSES may not be the same as the effluent quality based on BAT for a direct discharger.

The pollutants regulated by the proposed pretreatment standards for existing sources (PSES) are total chromium, ammonia, and sulfides. In addition to limitations for these pollutants, the proposed pretreatment standards for new sources (PSNS) also include limitations on the pollutants regulated by BAT.

The Agency concludes that the total investment cost incurred by existing sources, both direct and indirect dischargers, to achieve these effluent limitations guidelines (BPT and BAT) and pretreatment standards (PSES) is $65 million, with total annualized cost of $34 million. A total of approximately 300,000 lbs/yr of chromium will be removed by compliance with BAT effluent limitations, and more than 2 million lbs/yr of chromium will be removed from POTW sludges by compliance with PSES. In addition, approximately 59 million lbs/yr of conventional pollutants and 2.3 million lbs/yr of nonconventional pollutants will be removed by BAT/ and 172 million lbs/yr of conventional pollutants and 5.7 million lbs/yr of nonconventional pollutants will be removed by compliance with PSES.

REFERENCE: EPA, 440/1-79/016, July 1979, All pages.

59. DISPOSAL EFFECTS OF CITRUS BY-PRODUCTS WASTES

by

R. G. Ludwig and R. V. Stone

This study examined the disposal effects of citrus by-products wastes at the Orange Products Division of Sunkist Growers, Inc. in Ontario, California. Five types of waste products were produced; these were: cooling water, pectin waste, pulp press liquor, processing plant wastes, and cannery floor washings made up the waste characteristics. The waste is disposed to a disposal area of 220 acres divided into 4 plots, which is rotated during the year. In the area, farming has been very successfully proportioned with spreading operations. Most of the suspended solid waste filters out in the first inch of topsoil, so that organic buildup forms on the surface soil. A monitoring program has been set up to record the effects on groundwater. This involves a sampling and analysis at least twice a year on 10 wells. The effects on the groundwater mineral quality seem to conclude that the mineral content of the water applied at a citrus spreading is higher than for the groundwater, so the concentrations of the mineral ions are gradually increasing. When the study of the citrus waste on groundwater quality was started, it was anticipated that the main effect on groundwater would be organic, but the data shows that little or no pickup of organics; however, there was a significant increase in mineral matter and some reduction in pH.

REFERENCE: Water and Sewage Works, November 1962, pp. 410-415.

60. DISPOSAL OF HIGH ORGANIC CONTENT WASTES ON LAND

by

Ralph H. Scott

Liquid digested sewage waste, cheese manufacturing whey, and spent sulfite liquor were studied as to their disposal liquor by land treatment. The high organic concentrations of each waste were the primary concern. Volume of waste applied to a given site appeared to be the main criteria which needed to be determined. Of the projects completed, only one case resulted in pollution of the ground water. Sewage and whey may both be readily used as land applicants, while spent sulfite liquor disposal requires a great deal more care.

REFERENCE: Journal of WPCF, Vol. 34, No. 9, September 1962, pp. 932-950.

61. DISPOSAL OF TANNERY WASTES

by

R. R. Parker

This paper discusses the treatment and disposal of tannery wastes. Some treatment methods discussed included screening, sedimentation, lagoon settling, sulfuric acid neutralization, and precipitation of chromic hydroxide. The nature of the recieving medium is the principle factor in selecting a certain treatment method. After these processes, the effluent is generally suitable for discharge into a local sewer. The report gives a detailed account of one working system, its problems, and the estimated cost of installing spray irrigation as the primary form of disposal.

REFERENCE: Proceedings of the 22nd Industrial Waste Conference, Purdue University, 1967, pp. 36-43.

62. EFFECT OF CHELATES ON THE MOVEMENT OF FISSION PRODUCTS THROUGH SOIL COLUMNS

by

E. H. Essington and H. Nishita

This experiment was conducted to determine the effect of chelates when used to leach radioactive debris. Also included with the chelates were distilled water and mock irrigation water. Each percolate was then tested repeatedly on a number of radionuclides. Different radionuclides were found to vary intensly in their ability to be leached. It was also discovered that the use of chelates before leaching considerably affected radionuclide movement through the soil.

REFERENCE: Plant and Soil, Vol. 24, February 1966, pp. 1-23.

63. EFFECT OF DETERGENT APPLICATION ON THE GROWTH OF CORN

by

J. N. Judy et al.

Two types of detergents were tested to determine their effects at different concentrations in two types of soil on the growth of corn plants. A slight stimulation in growth appeared where watering solutions contained low detergent concentrations while stronger concentrations resulted in yield decreases. The stimulation is thought to have been the result of phosphorus in the detergent with detrimental effects arising from increased salinity, primarily from sodium salts. Boron availability and pH fluctuation did not seem to affect corn growth. Clay soils were found to grow plants more capable of withstanding detergent applications than were sandy soils.

REFERENCE: Journal of Environmental Quality, Vol. 2, No. 2, 1973, pp. 310-314.

64. EFFECT OF SOIL APPLICATION OF FLY ASH ON CHEMICAL COMPOSITION AND YIELD OF CORN (ZEA MAYS L.) AND ON CHEMICAL COMPOSITION OF DISPLACED SOIL SOLUTIONS

by

C. O. Plank et al.

Fly ash, a type of furnace residue, was applied to corn crops to determine its effect on the chemical composition of plants and soils and its effect on plant growth. From the examination of plant tissues, no significant increase of phosphorus, potassium, calcium, or magnesium was found. A slight increase in the boron content was discovered. However, it was not high enough to approach the toxic level. Soil samples taken were found to contain increased levels of boron, calcium, magnesium, and nitrate concentrations while no significant increase of aluminum, manganese, potassium, sodium, or chlorine was seen. The application of fly ash could possibly become beneficial in that its addition to soil reduces acidity and increases the available water holding capacity of some soil types.

REFERENCE: Plant and Soil, Vol. 42, 1975, pp. 465-476.

65. EFFECTS OF PH ON THE MUTAGENICITY OF SODIUM AZIDE IN NEUROSPORA CRASSA AND SALMONELLA TYPHIMURIUM

by

Craig R. Tomlinson

Neurospora crassa, resting conidia and in conidia from heterokaryon cultures #12 and #59 were planted at various pH values with sodium azide. No forward mutation beyond the (adenine-3 control frequency) was observed. Adenine-3 mutants were planted in the same manner with no reverse mutation beyond the SET control. Data showed that pH 3 sodium azide inactivates conidia by interaction with cytoplasm, not the nucleus, thus no mutations took place. Dependence of sodium azide mutagenicity in relation to pH was investigated in histidime-requiring mutants of Salmonella typhimurium with suspension tests. There were no differences in the reversion frequencies with pH values from 3 to 8. Conclusion: No pH dependency is associated with sodium azide mutagenicity, and not growth or DNA replication is required for mutagenicity in S. typhimurium by sodium azide.

REFERENCE: Mutation Research, Vol. 70, 1980, pp. 179-191.

66. EFFECTS OF SOME NITROGENOUS MATERIALS AND WETTING AGENTS ON SURVIVAL IN SOIL OF LESION, STYLET, AND LANCE NEMATODES

by

P. M. Miller

Three types of nematodes, lesion, stylet, and lance nematodes were studied as to their resistance to applications of nitrogenous materials and wetting agents. Lesion and lance nematodes, which exist more in the plant roots, were more easily injured than the stylet nematodes, which are more commonly found in the soil. This is thought to be caused by the lance and lesion nematode's lack of adjustment to substances released during decay reactions to which stylet nematodes have adapted.

REFERENCE: Phytopathology, Vol. 66, 1976, pp. 798-800.

67. AN EVALUATION OF THE PROPHAGE λ INDUCTION (INDUCTEST) FOR THE DETECTION OF POTENTIAL CARCINOGENS

by

William T. Speck et al.

Twenty chemical agents were analyzed by two different methods to detect substances containing DNA-modifiying agents. One method called the Salmonella assay is the most widely used technique for detecting carcinogens, but is still not capable of detecting a number of such substances. The second method was an experimental version of prophage induction called the Inductest, which had been modified to increase its sensitivity to carcinogens. It was thought that the Inductest could be used to supplement the Salmonella assay. The analysis showed that the Inductest responded to only three of the twenty agents, and these agents were all detected by the Salmonella procedure. Thus, the Inductest is not a valuable type assay in determining these types of environmental agents.

REFERENCE: Mutation Research, Vol. 54, 1978, pp. 101-104.

68. EXCHANGE PROPERTIES OF A SOIL USED FOR THE DISPOSAL OF ALKALI CANNERY WASTES

by

L. R. Webber et al.

Alkali wastes containing sodium may cause salt-affected soils if applied to soil as a method of disposal. The salinity of two such soils was monitored for calcium carbonate equivalent, electrical conductivity, and sodium saturation of the exchange complex. Salinity was not found to be a problem. However, if salinity hazards did occur, calcium sulfate applications would be used to solve the problem.

REFERENCE: Food Processing Waste Management Proceedings, Cornell Agricultural Waste Management Conference, 1973, pp. 69-73.

69. EXPERIMENTAL SPRAY IRRIGATION OF PAPERBOARD MILL WASTES

by

Harold C. Koch and D. E. Bloodgood

Auglaize Division Mill of the Western Paper and Manufacturing Company had to find another way of distributing wastewaters. Spray irrigation disposal was decided to work most efficiently when compared to other methods of disposal procedures. Applicability of spray irrigation for disposal of particular wastes has not been fully evaluated. Different sources of woods are produced at the mills. To mention, some are of lineboard quality. Others include paperboards, boxboards and papers. There is no cooking or wasting of the stocks used; therefore, the main sources of wastewaters are from the paper machines. The St. Mary, of Ohio receives the wastes from the mill. Due to the depth and movement of waters in this stream, the application of wastes is relatively slow. During the summer and fall months, the water level is at its lowest causing a small flow at this point. By recirculating water, there is a reduction in total volume of water that was formally discharged. Also there is a decrease in the total amount of suspended solids lost and to a lesser degree the total amount of soluble solids discharged. Not all the wastes were reduced, so there was not a sufficient prevention toward excessive overload into the stream. Treatment by sedimentation was considered, but this would lead to a sludge disposal problem; more adequate methods were discussed. Land was purchased on which experiments with the wastewater could be conducted. The land was bought with the amount of land required per unit volume of waste to be disposed in the experiments in mind. The land was located near the Miami and Erie Canal. The land bought for experimentation had been cultivated, and at the time of purchase, was producing crops of alfalfa, timothy, corn, and soybeans. Piping was set up, and the wastewaters were dispersed through a sprinkle system. Water dams were constructed to allow buildup of waters, and then the water was pumped through the pipes and sprayed on the fields. A scheduled pattern was followed with application of waste on two different sprinkler systems. Alternating every two days, the wastewaters were moved to different location sprinklers. For example, sprinklers 1 and 2 were on Monday, sprinklers 3 and 4 on Tuesday, and so on. The amount of time on each sprinkler may have differentiated with the hours the sprinklers worked. During the experiment, alfalfa was cut three times producing beneficial crops. A crop of corn was also planted and revealed no damage to the materials. Experienced farmers observed the field and the crops harvested and accepted the wastewater with proper distribution. At this time, the experiment is still in the trial run, but no serious problems are anticipated. The winter season tends to raise questions with how the pipes will adjust to the cooler weather. Icicles did form on some top plants and in various places surrounding the sprayer, but the ponds never formed a thick layer of ice. Thus, this shows absorption being done. The land development has increased with further expanding of pipes, land, sprinklers and replacement of crops with grasses. By expanding the system and program, it is expected to have a more complete evaluation on abatement of pollution in streams. Prospects for developing a spray irrigation disposal method, which will satisfy the needs of this mill, are good.

REFERENCE: Sewage and Industrial Wastes, Vol. 31, No. 7, July 1959, pp. 827-835.

70. EXPERIMENTAL SPRAY IRRIGATION OF STRAWBOARD WASTES

by

A. D. Meighen

This project studied the feasibility of using spray irrigation for the disposal of strawboard wastes. This system was designed to dispose of only the portion of waste which would reduce the BOD and allow the remaining waste to be disposed of in a receiving stream. This method appears to be desirable in that waste is disposed of successfully, cover crops on disposal areas are not severely damaged, and spray irrigation holds several advantages, such as low cost and no harmful side effects which previously used disposal methods possessed.

REFERENCE: Proceedings of the 13th Industrial Waste Conference, Purdue University, 1958, pp. 456-464.

71. FATE OF PETROLEUM HYDROCARONS IN SEWAGE SLUDGE AFTER LAND DISPOSAL

by

D. Liu

This study determined the fate of petroleum hydrocarbons in sewage sludge after farmland disposal. One main concern was the possibility of heavy metals and other toxic organic substances accumulating in the soil. The application of sludge left high concentrations of petroleum hydrocarbons in the top layer of the soil. Some phytotoxicity was found in the plants as a result of this accumulation. However, n-alkanes which represent the majority of the hydrocarbons were significantly degraded after a one year period. It is plausible that sludge treatment of some soil could, over a period of time, increase the rate at which hydrocarbons would be degraded.

REFERENCE: Bulletin Environmental Contamination Toxicology, Vol. 25, 1980, pp. 616-622.

For article on related subject No. 30.

72. FERTILITY AND TOXICITY OF CHEMICAL SEWAGE SLUDGES

by

S. A. Black and H. Kronis

To determine crop fertility and toxicity levels of sludges, studies are being conducted regularly. The production sludge has come about by sewage treatment applied chemically for removal of phosphorous. Several lime sludges with traces of fertilizer supplement were used in the studies to get the effect of greenhouse pots containing tomato seeds. Height, weight, and chemical analyses were recorded on a weekly basis after twelve weeks of growth. A follow-up of measurements were taken after the crop had been harvested and replanted excluding any treatment. Application of sludge at a rate of 10 to 80 metric tons/ha revealed beneficial increase on crops of fertilized and unfertilized soils. The application rate of optimum proved to be a little higher at 90 metric tons/ha. In heavy metals by the crop, sludge seemed to increase uptake, but sludge decreased uptake of other crops. Heavy metals did not correlate directly with the sludge applications, but showed a higher level of heavy metals were taken up by the second crop rather than the first crop.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 194-213.

73. HAZARDOUS WASTES GET THE TREATMENT FOR REUSE

by

Richard A. Young

A new chemical service developed by SCA Chemical Services Company solves the problems of handling toxic wastes in compliance with local, state, and federal regulations. This process recovers and reutilizes raw materials. The increased costs of raw materials has made this process economically feasible. Those wastes with limited recoverability may be used as catalysts in breaking down or neutralizing other wastes.

Products from waste processing can be classified into three groups: 1. recovered or reusable organics, acids, alkalines and fuels, 2. detoxified chemicals and treated inactive aqueous process effluent, and 3. dewatered sludge and concentrated solid residues.

Incoming wastes are classified into five groups according to function: 1. organically contaminated aqueous waste, 2. acid recovery, 3. fuel reclamation and formulation, 4. acid/base redox neutralization, and 5. fuel reclamation and formulation. Each of the above processes is described and diagrammed within the article.

REFERENCE: Pollution Engineering, June 1979, pp. 54-56.

74. HEAVY METALS IN SWEDISH SOILS: ON THEIR RETENTION, DISTRIBUTION AND AMOUNTS

by

Arne Andersson

The sorption of several metals was studied in laboratory tests to evaluate the different effects the metals have on the soils. In acid areas, organic substance had greater effect in adsorbing the heavy metals compared in other minerals. Lead and chromium were the two to have the least in pH which caused a low sorption rate. Salt effected some of the elements causing flocculation. Other metals were released by ion exchange. Clay content had a strong correspondence with the following metals: manganese, copper, zinc, nickel, cobalt, chromium, lead, and cadmium.

REFERENCE: Swedish J. Agric. Res., Vol. 7, 1977, pp. 7-20.

75. HUMAN PERIPHERAL BLOOD LYMPHOCYTES FOR THE ANALYSIS OF CHROMOSOME ABERRATIONS IN MUTAGEN TESTS

by

H. J. Evans and Maurene L. O'Riordan

Both advantages and disadvantages of using human lymphocytes are surveyed. All types of damages assayable are covered, both chromosome-types and chromatid-types. All materials, methods, and procedures are explained, and the statistical calculations to relate the results are given.

REFERENCE: Mutation Research, Vol. 31, 1975, pp. 135-148

76. HYDROLIGIC AND QUALITY EFFECTS OF DISPOSAL OF PEACH CANNERY WASTE

by

F. J. Hanks et al.

There has been an increased interest in the growth of the food processing industry. The disposal of cannery wastes has presented the management with some puzzling problems. Since it is no longer acceptable to dump wastes directly into a stream or lake or treat wastes in lagoons or sewage-treatment facilities, the industry is turning to spreading waste on the soil surface.

In this article, the following procedures are described: collection and preparation of soil cores, collecting and storing waste water, treatments, and measurement and analysis of wastewater. Results discussed in this article are analyses made on samples, pH alkalinity, solids, biochemical oxygen demand, cone effect on quality, infiltration analysis and evapotranspiration analysis. A lengthly part of the article is given to a discussion of results and a conclusion.

REFERENCE: Transactions of the ASAE, 1968, pp. 90-93.

77. IDENTIFICATION OF TRACE ORGANIC COMPOUNDS IN TIRE MANUFACTURING PLANT WASTEWATERS

by

Gregory A. Jungclause et al.

Effluents from two tire plants were gathered and tested. Although the plants measure similarly in terms of biochemical and chemical oxygen demand, a need was seen to measure these effluents by chromatography to determine the individual chemical components. It was found that these two plants differed greatly in the types and amounts of organics let back into the environment and the relative toxicity of these pollutants. Closer tolerances on specific compounds were advised.

REFERENCE: Analytical Chemistry, Vol. 48, No. 13, 1976, pp. 1894-1896.

78. INFLUENCE OF TANNERY EFFLUENTS ON SOILS AND CROPS AND PROPER DISPOSAL OF EFFLUENTS

by

S. Varadarjan et al.

Effluent from tanneries has caused some potential problems to nearby soil and water resources. The effluent, which is highly saline primarily from sodium salts, is to be treated using screening, evaporation, and biological methods. Portions of the waste would then be used as fertilizer, while some would require another disposal method. Land which had already been affected by the effluent was treated by flooding procedures to leach away salts. Gypsum and organic matter applications will adjust pH and enhance the soil's physical properties.

REFERENCE: The Madras Agricultural Journal, Vol. 57, No. 7, July 1970, pp. 345-360.

79. LABORATORY PROCEDURE FOR ASSESSING SPECIFIC LOCUS MUTATIONS AT THE TK LOCUS IN CLUTURED $L_{517}8Y$ MOUSE LYMPHOMA CELLS

by

D. Clive and Jo-Anna F. S. Spector

This technique was brought about to measure mutation frequencies in cultured mammal cells at a specific locus. Methods for using the genotypes of thymidine kinase enzyme in quantitative analysis of forward and reverse mutations are discussed. This test is simple, not costly, and results are relevant to mammals, not micro biota.

REFERENCE: Mutation Research, Vol. 31, 1975, pp. 17-29.

80. LAND APPLICATION OF DREDGING, CONSTRUCTION, AND DEMOLITION WASTE MATERIALS

by

C. R. Lee et al.

Large volumes of sediment are dredged from water ways in order to keep them navigable each year. Many lakes, streams and coastal waters must also be cleared. In the past, the sediments produced by these dredgings have been discharged on land and water with little need for concern; however, many of the harbors and water ways have become contaminated thus polluting the dredged sediments. This raises the need for safe and responsible disposal of these sediments. Construction and demolition waste material has also become a concern in somewhat the same respect as dredging wastes.

Elements taken into consideration are composition of dredged material methods of collection and transportation, land application potentials, legal restrictions, and social and psychological concerns of communities near land application sites.

With deterioration and transition of people out of the city, demolition of older urban structures has increased. It is important to consider construction and demolition wastes. The elements concerning these wastes discussed in this article are composition of wastes, methods of collection and transportation, productive use and reclamation, social and psychological concerns, and future trends.

REFERENCE: Land Application of Waste Materials Soil Conservation Society of America, 1976, pp. 165-178.

81. LAND APPLICATION OF WINERY STILLATE WASTES

by

Ronald W. Crites and Robert C. Fehrmann

The process of applying winery stillage wastes to land in California has been done for many years. In 1979, a year long study and monitoring program was set up. These were established in order to gather information on odor and environmental effects of the wastes applied to the land. This was done on the basis of understanding the operating conditions, information from the monitoring program, and to state any necessary changes. Most of the sites had the adequate type of sandy soil which provided satisfactory operations. Following drying of the soil, it is tilled for a better performance of crops. Research shows organic loading in proportioned amounts (16,000 lb/acre/day) of COD greatly increased the activity of soil bacteria. Applications of BOD were given at a rate of 600 lb/acre/day. Environmentally, organic matters do not cause harm, but certain constituents like nitrate-nitrogen can leach downward into groundwaters. In some cases, immobilization of the nitrogen may occur by microbial action. Accumulation of constituents takes place primarily in the upper level of the soil with concentrations decreasing with soil depth. Groundwaters in the area were not affected when tests for electrical conductivity, nitrates, and pH were run. Finally, the report presents a design for a rapid infiltration facility.

REFERENCE: Industrial Wastes, January/February 1981, pp. 14-16.

82. LAND DISPOSAL OF CHEMICALLY TREATED WATERS AND SLUDGES

by

Stacy L. Daniels and Emery S. Conyers

This article states that while the amounts of ferric chloride added to waste water as a coagulant during treatment is not a significant source of trace elements that might be problematic in liquid or solid effluents, care should be exercised when the ultimate disposal of the treated effluent is to be on land used for agricultural purposes. High concentrations of elements and resulting compounds may become present if the sludges being disposed of are not monitored for elemental components and amount thereof.

REFERENCE: Watereuse--Proceedings of the 2nd National Conference, 1975.

83. LAND DISPOSAL OF HAZARDOUS WASTE PROCEEDINGS OF THE 4TH ANNUAL RESEARCH SYMPOSIUM

by

David W. Shultz (editor)

All reports presented in the 4th annual S.H.W.R.D. Research Symposium are compiled herein. These papers are arranged in order of presentation at the symposium. The general areas covered are methods development and economic assessment, identification of pollutant potential, predicting trace element migration, modification of disposal sites and waste streams, and alternatives for land disposal.

REFERENCE: EPA-600/9-78-016, PB 286-956, 1978, pp. 1-438.

84. LAND DISPOSAL OF MINERALISED EFFLUENT FROM A PULP AND PAPER MILL

by

J. P. Hayman

This experiment investigated spray irrigation disposal of mineralized pulp and paper mill effluent. Because of high sodium content in the effluent, soil ammendments, gypsum, and ferrous sulfate were applied along with various amounts of nitrogen phosphorous and potassium fertilizers. Results indicated that it would be possible to grow crops successfully by this method of controlled irrigation.

REFERENCE: Progress in Water Technology, Vol. 9, No. 4, pp. 1039-1040.

85. LANDFARMING DISPOSES OF ORGANIC WASTES

by

Dr. Carl F. Frandsen

This paper examines the controlled application of cultivation of wastes on soil at an appropriate site in order to use micro-organisms naturally in the soil from which they are used to decompose the organic fraction of the wastes. There are four distinct advantages that landfarming offers: 1. to dispose of the waste with minimum energy used; 2. the procedure is merely odorless; 3. the application can be repeated safely at many intervals; 4. since the landfarm takes on the appearance of a plowed field, it is not an eyesore. The site for the disposal of refineries' waste depends on the amount of contained organic material to be biodegraded, if the landfarming used is intensive or not, and the biodegraded rate. To spread the oily sludge waste on the surface of the land, many refineries use tanker trucks with pipes that distribute the waste. Periodically, samples of the subsurface soil are analyzed for nutrient content, oil content, and pH. The site is also monitored to stay within the environmental regulations and to ensure maximum efficiency of the biodegradation process. Some studies have shown that soil properties such as porosity, nutrient level, and water-holding capacity have been improved by landfarming. Also landfarming of industrial organic wastes and oil sludges, without any treatment of the sludge, deposits heavy metals in the soils. Therefore, the land is unsuitable for growing crops for human or animal consumption, but it can be used for other purposes.

REFERENCE: Pollution Engineering, Vol. 12, No. 2, February 1980, pp. 55-57.

86. LAND TREATMENT AND DISPOSAL OF FOOD PROCESSING WASTES

by

P. G. Hunt et al.

This study investigated the use of land treatment along with in-plant operations for the treatment and/or disposal of most types of food processing wastes. When conditions include an uniform type of pollutant, many of the conventional forms of treatment may be used. Food processing wastes, however, frequently exhibit a fluctuation in waste-load making land treatment a practical solution. Data on waste amounts, waste characteristics, and treatment systems are discussed in detail. These are necessary along with an understanding of the specific soil, plant, and microorganism characteristics to design an effictive treatment process.

REFERENCE: Land Application of Waste Materials Soil Conservation Society of America, 1976, pp. 112-113.

87. LAND TREATMENT OF FISH PROCESSING WASTES ON DREDGE SPOIL SITES: COMPARATIVE COST EVALUATIONS

by

Mark Meo et al.

A comparative cost analysis was done concerning the treatment of dredge spoil sites with fish processing wastes. Results showed that overland flow with marsh percolation could efficiently achieve the advanced treatment needed. Previously used methods included physical separation, air floatation, land treatment, and ocean disposal. Most of these were expensive as well as less effective methods. Overland flow shows the lowest operational cost because of its greater dependence on natural work services.

REFERENCE: Coastal Zone Management Journal, Vol. 3, 1977, pp. 307-318.

88. LAND TREATMENT SYSTEMS FOR POULTRY PROCESSING PLANTS

by

Michael R. Overcash et al.

This paper discusses land treatment systems for poultry processing waste materials. Over thirty such systems, including spray irrigation, overland flow options and sludge spreading have been developed. Several advantages common to all land treatment systems were found. They included minimal operating costs, energy conservation, and efficiency of waste discharge. This project included a study comparing in-plant source control to land treatment methods and a study which gave both a waste and a sight characterization. Land treatment was concluded as being the most desirable and economic form of poultry processing waste management.

REFERENCE: 34th Industrial Waste Conference, Purdue University, 1979, pp. 385-393.

89. LEAD AND CADMIUM CONTAMINATION IN THE AREA IMMEDIATELY SURROUNDING A LEAD SMELTER

by

H. W. De Koning

Examination of air, plant life, and soil was completed from lead and cadmium samples. The plants indicated portions of lead which could threaten animals grazing, but not human beings. Although the cadmium from this area was rather high compared to normal cadmium, it was not linked directly to the smelter or the location.

REFERENCE: Water, Air, and Soil Pollution, Vol. 3, 1974, pp. 63-70.

90. LITHIUM TOLERENCE OF WHEAT, BARLEY, RICE AND GRAM AT GERMINATION AND SEEDLING STAGE

by

I. C. Gupta

Seeds of wheat, barley, rice, and gram were placed in glass petri-dishes and moistened with 0, 5, 10, 15, and 25 ppm solutions of lithium and allowed to germinate. Wheat and barley at germination stage were not harmed by lithium as high as 20 ppm, but were adversely affected when the seedling stage was reached (96 hours). Rice reacted similarly to wheat and barley. Lithium tended to reduce the growth rate in gram seedlings at concentrations much less than 5 ppm. In all cases, the roots were damaged more than the shoots. The tolerance to lithium could be higher in soils than in sand cultures.

REFERENCE: Indian Journal Agric. Res., Vol. 8, No. 2, 1974, pp. 103-107.

91. METHODS FOR DETECTING CARCINOGENS AND MUTAGENS WITH THE SALMONELLA/MAMMALIAN-MICROSOME MUTAGENICITY TEST

by

Bruce N. Ames et al.

With the evidence obtained using this bacterial/mammalian-microsomal assay, most carcinogens were found to be mutagens. This test is very economical to use and supplies quick reliable linear dose-response curves. Herein are described the methods and procedures for its use, also, the results from 158 carcinogens tested for mutatgenicity.

REFERENCE: Mutation Research, Vol. 31, 1975, pp. 347-364.

92. MICROBIOLOGICAL OXIDATION OF AMMONIUM AND THIOCYANATE IONS IN SOIL

by

H. Gleen

This report discussed the oxidation of ammonium and thiocyanate ions by soil micro-organisms. Ammonium ions in enriched nitrifying soils are quickly oxidized to nitrate with only a fraction of nitrite being formed. Thiocyanate under similar conditions experiences a lag phase where oxidizing micro-organisms and nitrite are built up. When both types of ions are present, ammonium ions are metabolized to nitrite and then rapidly changed to nitrate anions. Thiocyanate is quickly changed to ammonium sulfate, then to nitrite, and then to nitrate. The study showed thiocyanate to temporarily inhibit nitrification in soil and to affect nitrate forming organisms more acutely than the nitrite forming type.

REFERENCE: Nature, Vol. 168, July 21, 1951, pp. 117-118.

93. MISCELLANEOUS CYCLIC AND ACYCLIC -- SECTION XV CHEMICALS (STATISTICAL HIGHLIGHTS)

by

David B. Beck

Note: The miscellaneous chemicals mentioned herein are not included in any previous section of this report.

Production, sales, and values of miscellaneous cyclic and acyclic chemicals used for refrigerants, aerosols, solvents and chemical intermediates are listed with attention to halogenated hydrocarbons.

REFERENCE: Synethetic Organic Chemicals, 1978, pp. 307-345.

94. MISCELLANEOUS END-USE CHEMICALS -- SECTION XIV AND CHEMICAL PRODUCTS

by

David B. Beck

Miscellaneous end-use chemicals are reported on in this section. Amounts produced, sold, and values are recorded for 1978. Cyclic and acyclic chemicals are both in this section. As a result of environmental legislation which restricts the use of lead aklyls in gasoline, the market is expected to continue a decline.

REFERENCE: Synthetic Organic Chemicals, 1978, pp. 293-305.

95. MOLYBDENUM CONTENT OF PASTURE PLANTS IN RELATION TO TOXICITY TO CATTLE

by

Isaac Barshad

An investigation was conducted to verify the assumption that molybdenum toxicity contributes to a disease which many cattle in the San Joaquin Valley of California suffer from. Samples were taken from the soil, plants, and dry cow dung and analyzed from molybdenum content. High concentrations of molybdenum were found in areas where the abnormal conditions showed in cattle. Legumes were found to absorb more molybdenum than nonlegumes. However, the plants appeared to be unaffected by the molybdenum. Some legumes grown in soil of extremely low total molybdenum content appear to absorb high quantities of molybdenum. Alkalinity in soils may increase molybdenum solubility. Molybdenum content of plants also appears to increase with age of the plant.

REFERENCE: Soil Science, Vol. 66, 1948, pp. 187-195.

96. MOVEMENT AND ACCUMULATION OF MERCURY IN APPLE TREES AND SOIL

by

R. G. Ross and D. K. R. Stewart

Erad (phenyl mercury acetate) was applied to apple trees to determine the behavior of mercury in the trees and the soil. Translocation was the primary means of mercury movement within the trees with little movement due to volatilization. Mercury in the soil is thought to exist as insoluble sulfides which are not readily absorbed by the plant root system.

REFERENCE: Canadian Journal of Plant Science, Vol. 42, No. 2, April 1962, pp. 281-285.

97. MOVEMENT OF SELECTED METALS, ASBESTOS, AND CYANIDE IN SOIL: APPLICATIONS TO WASTE DISPOSAL PROBLEMS

by

Wallace H. Fuller

Using 250 references and 81 citations of related factors, this report compiles knowledge concerning the selection and operation of land disposal sites for wastes containing arsenic, asbestos, beryllium, cadmium, chromium, copper, cyanide, iron, lead, mercury, selenium, and zinc. Discussion includes soil, waste interaction, geological information, and chemical interactions of both of the above with the studied elements. An informational gap is found; information involving organic and inorganic solutes and their interactions with the cited elements is lacking.

REFERENCE: EPA-600/2-77-020, 1977, pp. 1-257.

98. MOVEMENT OF TWO NONIONIC SURFACTANTS IN WETTABLE AND WATER-REPELLENT SOILS

by

W. W. Miller et al.

Soil Penetrant 3685 and Aqua Gro were tested at various concentations in soil columns to determine their effects on the hydraulic conductivity of the soil. Results of leaching the columns showed a decrease in flow rates when the surfactant was present. Aqua Gro was held comparatively tight with Soil Penetrant being more readily leached by tap water. Comparison of experimental values with values obtained from a theoretical model showed inconsistant correlations. The model may be useful in certain cases, but its use in the present form seems to be somewhat limited.

REFERENCE: Soil Science Society of America, Vol. 39, 1975, pp. 11-16.

99. A MULTIPARAMETER OIL POLLUTION SOURCE IDENTIFICATION SYSTEM

by

John W. Miller

By measuring 19 diagnostic parameters, it is possible to identify a crude oil. The crude is first fractioned at 600+F then subjected to the tests. Results showed that evan as few as 6 parameters were sufficient to determine a crude sample. Gas chromatography of the hydrocarbons in the sample were helpful in identification, but weathering reduces its effectiveness.

By using these parameters in a statistical procedure, unknowns can be matched and identified with knowns.

REFERENCE: EPA-R2-73-221, PR-224-787, 1973, pp. 1-95.

100. MUTAGENICITY OF ATRAZINE: A MAIZE-MICROBE BIOASSAY

by

Michael J. Plewa and James M. Gentile

Maize plants that were tested with atrazine contained a mutagenic agent in its water soluble extract. Plants not treated with atrazine did not contain mutagenic properties. The agent appears to remain active in the maize plant at least until microsparogenesis.

REFERENCE: Mutation Research, Vol. 38, 1976, pp. 287-292.

101. MUTATION INDUCTION WITH UV- AND X-RADIATIONS IN SPORES AND VEGETATIVE CELLS OF BACILLUS SUBTILIS

by

Hiroshi Tanooka et al.

This study was conducted to determine the quantitative differences between spore and vegetative cell mutation of deficient and proficient DNA-repair function strains that were irradiated. It also questioned wheather mutation was affected by treatment with caffeine after irradiation, as is Escherichi coli when treated with caffeine after irradiation.

REFERENCE: Mutation Research, Vol. 49, 1978, pp. 179-186.

102. NON-DISJUNCTION AND CROSSING-OVER INDUCED BY PHARMACEUTICAL DRUGS IN ASPERGILLUS NIDULAND

by

Margherita Bignami et al.

A means by which the non-disjunction and cross-over induced by drugs can be tested rapidly, utilizing diploids of Aspergillus nidulans, has been developed. This allows for semiquantitation of induced damage. One hundred ten special drugs were tested, and thirteen of them strongly increased the occurrence of somatic segregation. The spontaneous rate of non-disjunction was about $1 \cdot 10^{-5}$. The mutagenic drugs fall in the following classes: quinolines, sulfa drugs, benzodizepines, pyrazolidines, and various other drugs with widely different compositions.

REFERENCE: Mutation Research, Vol. 26, 1974, pp. 159-170.

103. ONE SOLUTION TO THE PCB-DISPOSAL DILEMMA

An excellent set of guidelines for disposing of polychlorinated biphenyl (PCB) was developed by Duke Power Co. The majority of the program calls for the identification and record keeping of PCBs. It also discusses reporting accidential spills and gives an outline of the company's spill report checklist. Various forms of the PCBs were also categorized for shipping and storage purposes. In addition, these guidelines include methods of spill cheanup and environmentally safe methods of disposal using incineration and landfill.

REFERENCE: Electrical World, Vol. 190, November 1, 1978, pp. 52-53.

104. ORGANIC TOXICANTS AND PATHOGENS IN SEWAGE SLUDGE AND THEIR ENVIRONMENTAL EFFECTS

by

J. G. Babish et al.

Sewage sludge can contain organic compounds that may or may not be degradable by soil biota. For this reason, it is suggested that sewage sludge not be used to amend agricultural soil due to known and unknown mutagenic or carcinogenic natures of these compounds that may be transported to crops.

REFERENCE: Organics of Sludge, Cornell University, Special Report No. 2, 1981, pp. 1-5.

105. PAPER MILL SLUDGE DISPOSAL ON SOILS: EFFECTS ON THE YIELD AND MINERAL NUTRITION OF OATS (AVENA SATIVE L.)

by

S. G. Dolar et al.

Primary and secondary treatment processes were set up to study the effect paper mill sludge would have on plant growth. In comparison with the sludge rate, the soil weight ranged from 2.5% to 10%. In the secondary treatment, traces of nitrogen and carbon were visible with the values of 12:2-50:1. This amount of visible nitrogen did not limit the plant growth. However, in comparing the secondary to the primary treatment, the carbon/nitrogen ratio organic matter was higher in the primary state. Nitrogen fertilizer was applied to crops and fields after sludge wastes had been distributed, but the concentration of fertilizer was high. In summary of this information, even after sufficient amounts of phosphorus, potassium, and nitrogen fertilizer were applied to the soil, the growth of the plants in time decreased.

REFERENCE: Journal of Environmental Quality, Vol. 1, No. 4, 1972, pp. 405-409.

106. PAPER MILL WASTE WATER FOR CROP IRRIGATION AND ITS EFFECTS ON THE SOIL

by

Ben D. Vercher et al.

Experiments were conducted to test the effects of using papermill waste water to irrigate croplands. In all cases studied, beneficial results were found from the waste water application. The crops studied which were benefitted included the following: corn, rice, Coastal Bermudagrass, common Bermudagrass, Dillisgrass and fescue. In some cases, the waste water application would alter such conditions as pH, soluble salts, exchangeable sodium and nitrogen content.

REFERENCE: Louisiana St. University A and M College, Agricultural Experiment Station Bulletin No. 604, December 1965, pp. 5-46.

107. PESTICIDE MOBILITY IN SOILS
III. INFLUENCE OF SOIL PROPERTIES

by

Charles S. Helling

Soil characteristics acting on pesticide movement were determined by correlation and multiple linear regression studies. Soil thin-layer chromatography showed mobility characteristics of 12 pesticides on 14 soils. Mobility of nonionic compounds related inversely to the adsorption of similar compounds, the capacity of field moisture, the contents of clay and organic matter, and the capacity of cation-exchange. Mobility of acidic compounds such as dicamba, picloram, fenac and 2,4-D correlated directly with soil pH and inversely with picloram adsorption. Mobility of pesticides had a tendency to increase with water flux.

Soils grouped according to clay content showed that montmorillonitic clay content related directly to a tendency for movement of acidic pesticides and that nonmontmorillonitic clay content related inversely.

Regression equations used usually took into account field moisture capacity. Water flux, simazine and chlorpropham adsorption were used for predicting movement; whereas, soil organic matter content of these parameters were not in the regression equation.

REFERENCE: Soil Science Society of America, Vol. 35, 1971, pp. 743-747.

108. PLANT METABOLIC ACTIVATION OF 1,2-DIBROMOETHANE (EDB) TO A MUTAGEN OF GREATER POTENCY

by

Barry R. Scott

The results of this study suggest that (Dibromoethane) EDB is converted to a mutagen by two reaction pathways. One way is a "Breakdown" product in vitro; the other involves metabolic activation by plants. These mutagens may persist in the plant tissue. Neither of the reaction pathways had been researched fully as of date of publication.

REFERENCE: Mutation Research, Vol. 47, 1978, pp. 203-212.

109. POLYCYCLIC AROMATIC HYDROCARBONS IN SOILS AND RECENT SEDIMENTS

by

M. Blumer and W. W. Youngblood

This report describes the natural formation of aromatic hydrocarbons. How these substances are transported, their distribution in soil, recent marine sediments, and environmental implications these hydrocarbons have are also discussed.

REFERENCE: Science, Vol. 118, April 1975, pp. 53-55.

110. POTENTIAL FOR LAND DISPOSAL OF TWO NONBIODEGRADABLE WASTES

by

William F. Ritter et al.

Land disposal of two nonbiodegradable nylon wastes were analyzed through lab and greenhouse experiments. Eves boro sands were utilized in the experiment. Studies were conducted to define the effect wastes had on groundwater by using soil columns, soil adsorption, and soil lysimeters. The greenhouse experiments were tested over a mixture of Kentucky 31 Fescue and Reed Canory Grass for emphasis of phytotoxicity. The degradation rate of wastes by soil microorganisms were analyzed in various Warbarg respirometers and soil dehydrogenase tests. The soil column and soil lysimeter experiments revealed levels of COD adsorption from the wastes. Certain characteristics of the adsorption in the wastes did not fit the Freundlich or Langmuir isotherms. Both dehydrogenase and respirometer tests showed the wastes were broken down slowly through a soil microorganism process. These wastes were, therefore, considered a cause of serious groundwater infection if applied to the soil.

REFERENCE: Transactions of the ASAE, 1981, pp. 945-950.

111. POWDERED CARBON-ACTIVATED SLUDGE--FILTRATION PROCESSES FOR PETROLEUM REFINERY WASTEWATER

by

J. S. McBride et al.

The purpose of this research program was to determine the effect of the addition of powdered activated carbon (PAC) to petroleum refinery activated sludge systems. Both bench-scale and full-scale tests were performed. A wide range of PAC concentrations and sludge ages were evaluated.

Bench-scale activated sludge systems were designed and constructed. The bench-scale units were initially operated to determine the conditions for the full-scale test. Additional bench-scale tests were carried out to evaluate conditions impractical to meet during the full-scale testing.

Similar results were obtained during the full-scale and bench-scale tests. A moderate enhancement of COD removal was observed. PAC addition had little effect upon the removal efficiency of other contaminants or the toxicity of undiluted effluents. An economic analysis of PAC addition was carried out.

REFERENCE: EPA 600/S2-82-076, September 1982, pp. 1-2.

112. A QUANTITATIVE ASSAY OF MUTATION INDUCTION AT THE HYPOXANTHINE-GUANINE PHOSPHORIBOSYL TRANSFERASE LOCUS IN CHINESE HAMSTER OVARY CELLS (CHO/HGPRT SYSTEM): DEVELOPMENT AND DEFINITION OF THE SYSTEM

by

J. Patrick O'Neill et al.

This assay measures mutation induced at the Hypoxanthine-Guanine Phosphoribosyl Transferase Locus in Chinese hamster ovary cells. Mutant cells which resist effects of 6-thiogurnine were labeled mutant because 6-thioguanine is lethal to mammalian cells, but resisted by cells that by mutation loose the enzyme-(Hypoxanthine-Guanine Phosphoribosyl Transferage). Quantitation for selection by resistance to 6-thioguanine and the experimental conditions involved therein are described.

REFERENCE: Mutation Research, Vol. 45, 1977, pp. 91-101.

113. RAPID DETECTION OF MUTAGENS AND CARCINOGENS

by

Eve E. Slater et al.

DNA polymerase deficient bacteria are more sensitive than their parent strain to agents that can alter cellular DNA. This attribute can be used to screen for potential mutagens and carcinogens. The DNA polymerase deficient bacteria used was (pd A-) rate of mutation.

This assay system is only valid when (pol A-) growth is inhibited. If no inhibition is shown, then the agent is inactive or unable to penetrate the cell.

REFERENCE: Cancer Research, Vol. 31, 1971, pp. 970-973.

114. REACTIONS OF CHROME TANNERY SLUDGE WITH ORGANIC AND MINERAL SOILS

by

Carlos Wickliff et al.

Tannery sludge may be applied to agricultural land and used as fertilizer, but four situations must be considered. First, total and available nitrogen; second, total salt content; third, total and available chromium, and fourth, the soil organic matter. These should be considered and applied to the soil accordingly. For example, it can benefit crops if nitrogen is added as an alternative fertilizer. Some tannery waste were treated with additional chromium^3 plus salt. This proved to decrease the pH in the soils. Therefore, the tannery sludge can increase soils electroconductively up to the highest rate of chromium^3 salt. This rate was exceeding the values suggested for good crop turnover. Tannery sludge can be applied to the soil for productivity, but allowances must be made toward the rate of admission and available salt content.

REFERENCE: Water, Air, and Soil Pollution, Vol. 17, 1982, pp. 61-74.

For article on related subject see No. 37

115. RESPIRATION-DEFICIENT CHINESE HAMSTER CELL MUTANTS: GENETIC CHARACTERIZATION

by

K. Soderberg et al.

A genetic experiment was conducted with a series of mutants of a Chinese hamster cell that was defective in oxidative energy metabolism. The mutations revealed a recessive characteristic in intraspecies hybrids. The mutants consisted of thirty-five groups which were broken into eight complementation groups. One of these mutants did not complement two of distinctive complementary groups. It is possible this cell was carrying two mutations or a deletion. Due to the differences in frequencies with mutants, the cells were isolated and treatment was administered with mutagens, while spontaneous revertants appeared at unmeasurable or low frequencies. One exception was the mutant with noticeable frequency of spontaneous reversion was defective in mitochondrial protein synthesis, and the question brought to mind was whether the mutation was on the mitochondrial genome. A full scale analysis of reversion rate and comparison with rates was conducted for other mutations consistent with a nuclear mutation. By experiments involving fusions with cytoplast, this conclusion can be supported.

REFERENCE: Somatic Cell Genetics, Vol. 5, 1979, pp. 225-240.

116. A REVIEW OF THE ARSENIC CYCLE IN NATURAL WATERS

by

John F. Ferguson and Jerome Gavis

This report gives a review of the cycling of arsenic in freshwater. It also discusses the chemistry of aqueous systems containing arsenic and removal of the substance. Both local and global cycles are stated along with a history of arsenic and its origin. The danger of arsenic pollution results primarily from natural and cultural factors. The cultural aspects, including burning fossil fuels and the mining and processing of sulfide minerals, account for many high concentrations of arsenic in localized freshwater areas.

REFERENCE: Water Research, Vol. 6, 1972, pp. 1259-1274.

117. SCREENING OF PESTICIDES FOR DNA INTERACTIONS BY "REC-ASSAY" AND MUTAGENESIS TESTING, AND FRAMESHIFT MUTAGENS DETECTED

by

T. Kada et al.

The following chemicals, new pesticide ingredients, were found to be mutagenic: a. Captan (N-(trichlormethylthio)-4-cyclohexene-1,2-dicarboximide); b. Captafol (N-(1,1,2,2-tetrachloroethylthio-4-cyclohexene-1,2-dicarboximide), both base exchange mutagens; c. DAPA, Dexon (sodium-p-dimethylaminobenzene-diazosulfonate); d. NBT, Nitrit (2,4-dinitrophenyl thiocyanate), both framshift mutagens. These mutagens were detected by rec-assy and specifically labeled by E. coli WP_2 and the Ames Salmoella system.

REFERENCE: Mutation Research, Vol. 26, 1974, pp. 243-248.

118. SIGNIFICANCE OF TRACE METALS AND NITRATES IN SLUDGE SOILS

by

Robert E. Brown

Soils applied with wastewater sludge were found in some cases to accumulate excess concentrations of nitrates. Hazards arising from this may include pollution of the soil or even the groundwater. Applications of sludge should be monitored and adjusted to balance the available nitrogen with crop requirements, denitrification and volatilization losses to prevent nitrogen accumulation. No specific determinations were made for trace metals other than a positive need to control their concentrations in sludge-amended soils such as limiting the zinc, copper, and nickel concentrations to a certain percentage of the soil's cation exchange capacity.

REFERENCE: Journal WPCF, Vol. 47, No. 12, December 1975, pp. 2863-2875.

119. SISTER CHROMATID EXCHANGE AS AN ASSAY FOR GENETIC DAMAGE INDUCED BY MUTAGEN-CARCINOGENS. I. IN VIVO TEST FOR COMPOUNDS REQUIRING METABOLIC ACTIVATION

by

Daniel G. Stetka and Sheldon Wolff

This tests uses observable sister chromatid exchanges in animal's peripheral lymphocytes induced by chemical mutagens-carcinogens. The chemicals are injected into the animal's, then the lymphocytes are cultured and strained with the FPG technique. Chemicals that require metabolic activation and those that do not produce increases in sister chromatide exchange frequencies one day after injection. Frequency then declines to control level in under two weeks. This in vivo technique is highly sensitive in checking the ability of agents to damage chromosomes.

REFERENCE: Mutation Research, Vol. 41, 1976, pp. 333-342.

120. SLUDGE FARMING OF REFINERY WASTES AS PRACTICED AT EXXON'S BAYWAY REFINERY AND CHEMICAL PLANT

by

Robert S. Lewis

Exxon's Bayway Refinery and Chemical Plant has devised a land farming process that allows regular deposits of oil sludge that reveals acceptance in the soil. Materials such as oily wastes from tank cleanings and separator bottoms are being deposited on the sites selected at a rate of 150 tons/acre/year. Economically and environmentally this process seems to be reliable and sound when compared to other available disposal methods. In respect of potential environment regualtions, further studies are being conducted over development of work needed in the near future. Exxon feels confident that sludge farming is an affective way of dispensing wastes and will gain acceptance on a continual basis.

REFERENCE: Proceedings of the National Conference on Disposal of Residues on Land, 1977, pp. 87-92.

121. SOME EFFECTS OF CRUDE PETROLEUM ON SOIL FERTILITY

by

M. J. Plice

A study to determine the effects of crude-oil material on soils and vegetation was conducted in 1938. Observations of natural contaminations were also made. While previous studies revealed that petroleum may have a stimulating effect on plant growth (perhaps due to bacterial decomposition of the hydrocarbons), damage occurred in many instances as well. The extent and duration of the damage to the soil depends on the degree and depth to which it is saturated with oil. The damage was rarely due to toxicity of the petroleum, but was due to the obstruction of moisture and air to the plant roots. Reclamation of oil-damaged soils can be achieved through naturally occurring biological processes and cultivation.

REFERENCE: Soil Science Society Proceedings, Vol. 43, 1948, pp. 413-416.

For article on related subject see No. 40.

122. SOYBEAN (GLYCINE MAX): A NEW TEST SYSTEM FOR STUDY OF GENETIC PARAMETERS AS AFFECTED BY ENVIRONMENTAL MUTAGENS

by

B. K. Vig

Some soybean plant varieties have dark green, yellow, or double leaf spots. It is known that these spots are phenotypes controlled by the $Y_{11}Y_{11}$, $y_{11}y_{11}$, and $Y_{11}Y_{11}$-$y_{11}y_{11}$ genotypes. When treated with known mutagens, the plant responds by changing the frequency of which these spots occur. It was stated that these changes were due to somatic crossing over, point mutations and segmental losses. This response could possibly be used to study patterns of mutagenic action on the cellular level.

REFERENCE: Mutation Research, Vol. 31, 1975, pp. 49-56.

123. SPRAY IRRIGATION FOR THE DISPOSAL OF EFFLUENTS CONTAINING DEINKING WASTE

by

Wesley A. Flower

This paper studies a spray irrigation project which has been developed for the disposal of effluents containing deinking waste. Spray irrigation is a prime choice because of its high BOD removal as well as being one of the most economical forms of disposal. Spray irrigation also solves various other treatment problems like persistent color and high concentration of settled solids in the effluent. The study concluded that in most situations modifications could be made to utilize spray irrigation as the primary source of deinking waste disposal.

REFERENCE: Tappi, Vol. 52, July 1969, pp. 1267-1269.

124. SPRAY IRRIGATION OF CERTAIN SULFATE PULP MILL WASTES

by

Stuart C. Crawford

This report discussed the use of spray irrigation as a method of sulfate pulp mill wastes. Predictions were made as to the ability of the soil to absorb the waste. Actual experiments resulted in the soil absorbing larger portions than expected. Spray irrigation proved to be an adequate treatment method which may be improved with future use. Soil pH was on the average increased while organic matter and mineral content suffered little change. Corn, peanuts, soybeans, and a number of types of vegetables were grown on treated land. Of the ones tested, both yield and quality were increased. The report then briefly outlines the installation cost of this system. The study concluded the spray irrigation, in this case, was an efficient waste treatment system which provided some benefits to the environment.

REFERENCE: Sewage Works Journal, Vol. 30, No. 10, 1958, pp. 1266-1272.

125. SPRAY IRRIGATION OF WASTES FROM THE MANUFACTURE OF HARDBOARD

by

Ward C. Parsons

Spray irrigation can be a good way of disposing waste, but the methods that need to be employed to operate a spray irrigation system safely and efficiently are not simple or constant from one location to another. This report is an account of 5 years of operation of a spray irrigation system disposing of hardwood manufacturing effluent, the advantages and disadvantages thereof.

REFERENCE: Proceedings of the 22nd Industrial Waste Conference, Purdue University, 1967, pp. 602-607.

126. SYSTEMATIC HAZARDOUS WASTE SITE ASSESSMENTS

by

R. B. Evans et al.

The purpose of establishing a systematic assessment method is to establish criterion and objectives in dealing with hazardous waste sites. Three main criterion for preliminary site assessment are evaluating the magnitude of the hazard, identifying the source and the nature of the release, and evaluating the factors that determine the necessity of immediate removal. Fulfilling objectives in terms of subsurface characteristics follow three main courses of action: 1. determining the hydrogeological characteristics of the site, 2. locating and mapping leachate plumes, and 3. locating and mapping buried wastes.

There are many remote sensing and assessment techniques that have just now come into use. These techniques alleviate the use of extensive drilling to obtain geologic information; however, surface testing is still invaluable.

An extensive case study of an attempt to locate and assess a hazardous landfill is described within this article. A list and description of a multitude of sensing techniques is also provided. Two tables and twelve figures are provided at the end of the article.

REFERENCE: Environmental Monitoring Systems Lab. & Technology, Inc. pp. 1-37.

For article on related subject see No. 8.

127. TRACE ELEMENT AND PLANT NUTRIENT CONSTRAINTS OF RECYCLING SEWAGE SLUDGES ON AGRICULTURAL LAND

by

A. L. Page and A. C. Chang

This paper discusses applying sewage sludge to agricultural land as to soil amendment. Supplemental nitrogen, phosphorus, and potassium are beneficial to most soils as is the organic matter content found in sewage sludge. The main problem with this type of disposal is the possible accumulation of trace elements such as barium, cobalt, chromium, manganese, nickel, mercury, and tin. Most of these trace elements are toxic to plants when present in high concentrations which could occur from sewage applications. There is the possibility of groundwater contamination should any of the higher trace element concentrations be leached over an extended period of time.

REFERENCE: Watereuse--Proceedings of the 2nd National Conference, 1975, pp. 201-209.

128. TRACE ELEMENTS IN SEWAGE SLUDGES

by

M. L. Berrow and J. Webber

Large concentrations of certain trace elements were found in 42 sewage sludges from rural and industrial towns in England and Wales. Total contents of 5% zinc, nearly 1% chromium and copper, and .5% nickel were found in certain dried sludges. Total contents of copper, tin, and zinc, and to a lesser degree, silver, bismuth, and lead were much greater than the levels of the elements in soils. Total contents of chromium and nickel were very high in a small number of samples. Acetic acid-soluble zinc and copper levels were higher than in soils. Percentage solubilities of manganese, nickel, and zinc were higher than chromium, copper, molybdenum, lead, tin, and vanadium. Zinc, copper, and nickel seemed to be the elements most likely to be toxic to plants from using sewage sludge as a soil additive.

REFERENCE: Journal Science Fd. Agriculture, Vol. 23, 1972, pp. 93-100.

129. USE LAND FARMING FOR OILY WASTE DISPOSAL

by

G. W. Grove

Three ways of disposing oily and biological sludge are discussed and compared. Land farming is concluded as being more environmentally, economically, and energy efficient then either direct landfill or incinerated ash landfill disposal.

REFERENCE: API Refining Meeting, 1978, pp. 138-140.

130. USE OF A SIMPLIFIED FLUCTUATION TEST TO DETECT LOW LEVELS OF MUTAGENS

by

M. H. L. Green et al.

This fluctuation test is a simple and an accurate means for detecting mutagenicity. It overcomes the problem of which mutation is spontaneous, and which is induced by measuring the spontaneous mutation rate first; then, observing the induced mutation throughout the experiment. Because of the high sensitivity of this test, it makes it useful in detecting low level or weal mutagens not usually detected by other tests.

REFERENCE: Mutation Research, Vol. 38, 1976, pp. 33-42.

131. THE USE OF DIFFERENT TEST SYSTEMS WITH YEASTS FOR THE EVALUATION OF CHEMICALLY INDUCED GENE CONVERSIONS AND GENE MUTATIONS

by

M. Loprieno et al.

By using yeasts in a laboratory, it has been predicted that experiments related to humans are a concern with genetic alterations when exposed to chemical genotoxics. Single and double yeast cells were treated in a test tube with the presence of mouse liver microsomes. Additional substances were living organisms from the peritonean of the mouse. With different methods to assay the genetic activity of a compound, the metabolic movement taking place in the mammalian body can be analysed. Reliable extrapolation could become more of a reliable source from laboratory experiments to man himself.

The comparison between doses and frequencies of induced genetic effects are explained by equations taken following regression analysis of the data. This allows a very good comparison between the different methodologies and genetic systems. Forward-mutations scored phenotypically represent one of the genetic systems on a nonselective medium. Five loci with different sensitivity were induced with mutations. Then an average data of mutation-induced loci were analysed.

The second system was a selective medium mitotic gene-conversion which was given to two loci with different kinetics.

Schizosaccharomyces pombe and diploid cells of Saccharomyces cerevisiae were then analysed for evaluation of gene-mutation and gene-conversion.

REFERENCE: Mutation Research, Vol. 25, 1974, pp. 197-217.

132. USE OF THE SPOT, PLATE AND SUSPENSION TEST SYSTEMS FOR THE DETECTION OF THE MUTAGENICITY OF ENVIRONMENTAL AGENTS AND CHEMICAL CARCINOGENS IN NEUROSPORA CRASSA

by

Tong-Man Ong

Spot, plate, and suspension tests in Neurospora crassa, using N23 and N24, are satisfactory replacements for the adenine-3 forward-mutation system for screening mutagenic activity of environmental agents and chemical carcinogens. N23 can be reverted to adenine-independence from adenine dependence by agents which cause base-pair translations. N24 is revertable by frameshift mutagens. Both N23 and N24 are highly sensitive to mutagens. Reversion is possible only by a specific group of chemicals.

REFERENCE: Mutation Research, Vol. 53, 1978, pp. 297-308.

133. THE USE OF YEAST CULTURES FOR THE DETECTION OF ENVIRONMENTAL MUTAGENS USING A FLUCTUATION TEST

by

James M. Parry

This study modified a microbial fluctuation to increase its sensitivity in the detection of environmental mutagens. Various strains of yeast were found to be acceptable for use in the fluctuation test. This type of test is more time consuming than other methods; however, it is much more sensitive especially at low concentrations. Some problems may occur in testing agents with high toxicity levels because of growth reduction of cells. By using appropriate cultures and conditions, this method can be useful in detecting environmental mutagens.

REFERENCE: Mutation Research, Vol. 46, 1977, pp. 165-176.

134. WATER QUALITY IN RELATIONS TO FERTILIZATION AND PULP MILL EFFLUENT DISPOSAL

by

Kenneth G. Watterston

This paper discusses the relationship of water quality to pulpmill effluent disposal by irrigation and fertilization in forestry areas. The only problems fertilization pose in forestry operations are far outweighted by its benefits to vegetation. Pulp mill effluent disposal on the other hand has been found to cause some problems primarily because of its high sodium concentration. The sodium ions cause excess dispersion in fine-textured soils which inhibits further irrigation. Sodium ions in coarse soils lack the amount of dispersion needed to prevent percolation which could lead to subsurface water contamination.

REFERENCE: The Consultant, Vol. 16, 1971, pp. 91-92.

135. WOOD-DERIVED TOXIC COMPOUNDS: REMOVAL FROM MILL EFFLUENTS BY WASTE TREATMENT PROCESSES

by

Dwight B. Easty et al.

Comparison was made as to the removal of resin, unsaturated fatty acids, their chlorinated analogs, chlorinated guaiacols, and epoxystearic acid between several waste treatment systems. It was found that aerated lagoons and air-activated sludge systems could remove up to 100% of the toxicants from kraft and sulfite mill process effluents, while oxygen-activated systems produced lower percentages of removal. Alum precipitation, lime precipitation, reverse osmosis, and ultrafiltration were other systems reviewed and reported on in this report.

REFERENCE: Tappi, Vol. 61, No. 10, 1978, pp. 57-60.

136. THE ABSORPTION OF MINERAL ELEMENTS BY FORAGE PLANTS: I. THE PHOSPHORUS, COBALT, MANGANESE, AND COPPER CONTENT OF SOME COMMON GRASSES

by

Kenneth C. Beeson et al.

Troubles occasionally occur in animals that have generated from poor nutrients in the forage they consume. Studies over phosphorus, cobalt, manganese, and copper were compared and analyzed among 15 samples of grasses. They were grown in a greenhouse under uniform conditions revealing Kentucky bluegrass; the most absorbant of high qualities of all these elements except manganese. One of the least nutrient based grasses, Timothy, proved to be lowest among these elements mentioned. There was not an overall correlation among the elements found in the tested grasses. Comparable compositional gasses have been placed together for further survey.

REFERENCE: Journal of the American Society of Agronomy, Vol. 39, 1948, pp. 356-362.

137. ACCUMULATIONS OF LEAD IN SOILS FOR REGIONS OF HIGH AND LOW MOTOR VEHICLE TRAFFIC DENSITY

by

A. L. Page and T. J. Ganje

This study compared the accumulations of lead in soil where automobile traffic density was high to soils with low traffic density. Over a forty year period small accumulations were found to high density areas while no accumulation occurred in areas of low automobile traffic. No potential hazards are forseen in that lead accumulation has not been found to reach high enough concentrations to be toxic to plants or to accumulate in any significant amounts in the plant tissue.

REFERENCE: Environmental Science and Technology, Vol. 4, No. 2, February 1970, pp. 140-142.

138. AMMONIA VOLATILIZATION FROM SOILS

by

Harry A. Mills et al.

Crops have been known to grow under better conditions if the fertilizer ($NH_4^{\pm}N$) is applied on soil reaction near neutrality. Tests have shown if soil pH turns into alkaline, a nitrogen loss of NH_3 occurs during volatilization. The basis of this study was to find if a healthy crop could lower the volatilization of nitrogen and in particular soils with pH 7 and above. The soil was placed in a closed system, and all the NH_3 was accumulated and drawn out by air and then gathered together. As a part of measurement, the $NH_3^{\pm}N$ gathered from the soil is judged for function of time, soil pH, presence or absence of seedlings, and nitrogen amount applied. Soil reaction did occur when $NH_4^{\pm}N$ was applied and caused ammonia losses. At pH 7.2, great inflection of NH_3-N loss happened. NH_3-N losses reduced in plants around 60% when in alkaline soils and even greater reduction in acidic or neutral soils. The conservation of nitrogen occurred through fast absorption of $NH_4^{\pm}N$ in the plant roots.

REFERENCE: Agronomy Journal, Vol. 66, May-June 1974, pp. 355-358.

139. ARSENIC FIXATION IN RELATION TO THE STERILIZATION OF SOILS WITH SODIUM ARSENITE

by

R. S. Rosenfels and A. S. Crafts

This report examined the sterilization of soils with arsenic by determining the fixation of arsenic compounds in various soils. Fixation was highest in heavy soils, which also required the most arsenic to sterilize them. Fixation occurred at varied rates in different soils. Data gathered on fixation as well as information from calculations from an equation were used to explain were used to explain toxicity in light of arsenic fixation.

REFERENCE: Hilgardia: A Journal of Agricultural Science, Vol. 12, No. 3, 1939, pp. 203-229.

140. BIOGEOCHEMICAL INVESTIGATIONS IN AREAS OF COPPER-TIN MINERALIZATION IN SOUTH-WEST ENGLAND

by

Anthony P. Millman

Biogeochemical studies were done to determine the content of copper, tin, zinc, lead, and silver in an area of oak, birch, willow, and beech growing in a zone of copper-tin mineralization in south-west England. Three abandoned copper and tin mines, as well as areas known to be free of mineralization, were sites where both soil and plant traverses were conducted. A semi-quantitative spectrographic analysis was made of plant ashes and soil samples. The results of this study were compared with similar studies previously done in Southern Nigeria and Northern Rhodesia. The results of this study reveal an association between trace amounts of ore metals found in plants growing in mineralized soils. Lead was found to concentrate in the twigs of trees rather than the leaves, while copper, tin, zinc, and silver concentrate in the leaves. However, certain trees are better indicators of this than others. This study is intended to aid in prospecting for ore metals.

REFERENCE: Geochemical et Cosmochimica Acta., Vol. 12, 1957, pp. 85-93.

For articles on related subject see Nos. 23 and 45.

141. BORON ADSORPTION EQUILIBRIUM IN SOILS

by

S. Shah Singh

This article shows the boron adsorption capacity in soil depends on soil texture. Langmuirs adsorption equation was found to be accurate when solutions had limited concentrations, but when all concentrations were checked, the values followed a quadratic curve which was identified as the BET form of adsorption isotherm relation.

REFERENCE: Soil Science, Vol. 98, 1964, pp. 383-387.

142. BORON IN CULTIVATED SOILS AND IRRIGATION WATERS

by

F. T. Bingham

Boron is an essential nutrient of some higher green plants. Low concentrations of boron can be phytotoxic to various plants. The range between boron being beneficial or toxic toward a plant is very narrow. Concentrations between 0.05 to 0.10 μgrams of boron/ml are usually safe and sufficient for many plants. For excessive concentrations of boron focused on plants, the range would be 0.50 to 1.0 μgrams of boron/ml.

Boron is found in organic matter, different soil minerals, and soil solutions. Boron is found in the three places just mentioned, but frequently in soil minerals. Much of boron is contained in minerals resistant to weathering, but it is also covered in organic fractions in soils. Boron is found in small amounts and primarily in surface soils. Organic fractions mineralize causing boron to redistribute among the water systems in the soil, which is beneficial to plant growth. Most boron serves as fertilizer or is utilized in irrigation waters which remain in soil solutions.

Three factors are considered with boron: the adsorption concentration, the soil formations pH, and the active units of adsorption. It is suggested that boron is absorbed in acid conditions as a molecular boric acid. The water-soluble boron is most frequently found in soil solutions which tend to work toward building up the plant. Dealing with boron in water-irrigation showed concentrations with as much as 1.0 μgrams or more, causing symptoms of injury toward certain orchard leaves. In some cases, where boron was found in heavy concentration, rain diluted the strength and it could be adsorbed at a greater excess for beneficial plant growth.

REFERENCE: Trace Elements in the Environment, 1973, pp. 130-138.

143. CATIONIC EFFECTS ON SULFATE ADSORPTION BY SOILS

by

Tsun Tien Chao et al.

This experiment showed the effects of cations on sulfate adsorption by soils. The amount of sulfate adsorption in soils saturated with various charged cations followed the order of chemical valency. The effects different cations had on adsorption were mainly related to pH; however, the specific type of cation did have some influence. Increasing the concentrations of sesquioxides, amorphous substances and exchangeable aluminum was found to subsequently increase pH influence.

REFERENCE: Proceedings of the Soil Science Society of America, Vol. 17, 1963, pp. 35-38.

144. THE CHEMISTRY AND PHYTOTOXICITY OF ARSENIC IN SOILS: I. CONTAMINATED FIELD SOILS

by

E. A. Woolson et al.

A comparison of soils treated with arsenic and non-treated soils showed a difference as high as 165 ppm arsenic and as low as 13 ppm arsenic. This study was taken from a number of 58 soil samples treated with arsenic. Various forms of arsenic were found, for example, in residual areas as iron-arsenic. This procedure of detecing such arsenic was accomplished with modified soil phosphorous. Aluminum and calcium-arsenic were other forms present in the soil. It was found that if certain amounts of reactive aluminum and calcium were high, then the reactive iron would be low. Plants revealed a tolerance to large applications of arsenic in soils containing highly reactive aluminum. Testing the contaminated and uncontaminated soils, a comparison of growth deduction and arsenic fragments showed a difference of 0.74 and 0.82.

REFERENCE: Soil Science Society of America Proceedings, Vol. 35, 1971, pp. 938-943.

145. COBALT CONTENT OF TYPICAL SOILS AND PLANTS OF THE HAWAIIAN ISLANDS

by

Giichi Fujimoto and G. Donald Sherman

Small quantities of cobalt in the diets of cattle and sheep have been thought to be instrumental in the prevention of bush sickness, a nutritional disease. An investigation was conducted to determine if a cobalt deficiency does exist in Hawaiian soils which might contribute to the occurrence of "Molokai Disease", a disease similar to bush sickness, which many Hawaiian cattle suffer from.

The investigation revealed that cobalt values range from 5 to 156 parts per million, the average of 80 samples being 36.1 parts per million, which is mid-range compared with soils world wide. The cobalt content of Hawaiian plants was found to be much higher comparatively. Values ranged from 0.20 to 7.50 parts per million. There appeared to be no correlation between cobalt content of the soil and that of the plant.

The possibility of a cobalt deficiency contributing to nutritional diseases in Hawaiian cattle has been eliminated as a result of this study.

REFERENCE: Agronomy Journal, Vol. 42, No. 12, December 1950, pp. 577-581.

146. A COMPARISON OF BORON DEFICIENCY SYMPTOMS AND POTATO LEAFHOPPER INJURY ON ALFALFA

by

W. E. Colwell and Charles Lincoln

Until recently, there has been no sure way to differentiate between boron deficient alfalfa and alfalfa acted upon by the potato leafhopper. This study did a comparative analysis on the symptoms of each. The most reliable way found to distinguish between the two is the distribution of discoloration on the plant. Other useful signs include the shortening of the terminal internode and an abnormality of the terminal bud in boron-deficient plants. These findings are substantial because some farming areas have boron-deficient and/or leafhopper infestation in alfalfa.

REFERENCE: Journal of the American Society of Agronomy, Vol. 34, 1942, pp. 495-498.

147. CONTAMINATION OF SOILS NEAR A COPPER SMELTER BY ARSENIC, ANTIMONY AND LEAD

by

Eric A. Crecelius et al.

This paper discusses the relatively high concentrations of arsenic, antimony, and lead in soil surrounding a copper smelter. These high concentrations were measured in the thin upper layer of the soil which shows little leaching at further depths. High concentrations of these elements were found up to ten kilometers from the plant. The copper smelter is the primary contributor to the arsenic and antimony elevation while high levels of lead at greater distances from the smelter are believed to be the result of automobile exhaust fumes.

REFERENCE: Water, Air and Soil Pollution, Vol. 3, 1974, pp. 337-342.

148. CONTRIBUTION OF ORGANIC MATTER AND CLAY TO SOIL CATION-EXCHANGE CAPACITY AS AFFECTED BY THE PH OF THE SATURATING SOLUTION

by

Charles S. Helling et al.

Sixty soils from Wisconsin were tested for the effect buffered solution had on cation-exchange. These soils were tested between pH levels of 2.5 and 8.0. The independent variables were of contributed contents of clay and organic matter of total CEC. In the cation-exchange capacity, the pH ranged from 2.5 to 8.0 allowing an average cation-exchange capacity of the organic matter to range from 36 to 213 mg, per 100 g. Within the clay and organic matter of CEC, the linearly increased with the pH. The cation-exchange capacity varied in these soils from 19% at pH 2.5 to 45% at pH 8.0. The mean of the organic matter and clay contents were 3.28% and 13.3% respectively. The coefficients of multiple correlation varied from 0.927 at pH 0.959 at a pH level of 8.0.

REFERENCE: Soil Science Society of America, Vol. 28, 1964, pp. 517-520.

149. COPPER TO MOLYBDENUM RATIO AND MOLYBDENUM AND COPPER CONCENTRATIONS IN RUMINANT FEEDS

by

J. E. Miltimore and J. L. Mason

Seven typical ruminant feeds were chosen from areas all over British Columbia. These hays and grains were to be treated for concentration of molybdenum and copper and then copper/molybdenum ratio. To cause copper deficiency the copper/molybdenum ratio would have to be less than 2 in the samples. Grass hays and sedge hays differed in their ratio of copper/ molybdenum. Sedge hays were 2.1 which left the grass hays 4.4 ratio more than half the mean of sedge hays. Remaining mean ratios were as high or higher than 5.0.

Nineteen percent of the samples were 2.0 or below. The lowest copper/ molybdenum being 0.1 ranging as high up as 52.7. This shows an extreme variability in the copper/molybdenum ratios. Molybdenum concentrations were found to be as low as copper concentrations. As copper increased in concentration, the copper/molybdenum increased when all the foods were compiled together. As copper increased, molybdenum concentration would increase, then decrease, and once more increase to the sample level of copper concentration. Of all feeds, only 1% were above 8.0 ppm molybdenum; 79 and 9.9 ppm had the highest value. In the copper concentrations, 3.0 ppm was the lowest of sampling and 10.0 ppm was the highest concentration ratio of the feeds.

This data confirms there is a high nutritional variability from copper/ molybdenum ratio concentration. This also proves low copper levels within the feeds, hays, and grains. To find the need for supplementation of copper, tests were done on copper and molybdenum. Of all the information on copper and molybdenum, this seems to be the first extensive form of information.

REFERENCE: Canadian Journal of Animal Science, Vol. 51, April 1971, pp. 193-200.

150. CROP GROWTH AND WET SOIL
CHAPTER 2

by

Jans Wesseling

This report presented information pertaining to the influence of drainage on soil aeration, soil temperature, and nitrogen availability. The report reviews possible problems associated with wet soil conditions. These problems include oxygen, ammonia and nitrate deficiency, and reduction of soil temperature; all of which are detrimental to various plant life. The paper concluded that plants respond to water-table depth and wet soil conditions differently depending on growth stage of the plant, time of the year, and plant type.

REFERENCE: Drainage for Agriculture, Vol. 17, 1974, pp. 7-37.

151. CROP RESPONSE TO EXCESSIVE ZINC FERTILIZATION OF ALKALINE SOIL

by

Louis C. Boawn and P. E. Rasmussen

Plants in this series of experiments were tested for endurance of zinc fertilization. Various field crops and vegetable crops were treated for zinc concentration in a similiar atmosphere. These crops were tested from a range of 10 to 500 ppms of zinc in alkaline soil for a response for the level of zinc concentration and dry matter yield decrease (YD). Most of the crops concentration levels were located between 400-600 ppm of zinc. An example of the variety of crops and their sensitivity to zinc were the grass crops being the most sensitive with 40% yield decrease or greater. Alfalfa, tomato, and lettuce were in the category between 20% and 40%. White potato, clover, and snap beans did not undergo any drastic yield decrease. Most crops were able to withstand concentrations up to 200 ppms of zinc, and a maximum of 300 before malformation. The only symptom visible due to the zinc treatment was a stunting in the crop, but the coloring and form remained the same.

REFERENCE: Agronomy Journal, Vol. 63, November-December 1971, pp. 874-876.

152. DAMAGE TO CANE SOILS BY ARSENIC

by

H. W. Kerr

Studies from entomologists have shown certain information about using white arsenic. It has been used for many years as a grub control, but has recently been revealed as being costly and damaging to the soil. If the application of white arsenic is stopped, it will still be a number of years before the soil has cleansed itself of the arsenic. An analysis of a farmer's soil, which he had used extensive amounts of arsenic, revealed a rate of 600 ppm.

REFERENCE: Cane Growers' Quarterly Bulletin, Vol. 6, April 1, 1939, p. 189.

153. DESIGN OF TILE DRAINAGE FOR FALLING WATER TABLES

by

Jan van Schilfgaarde

A knowledge of the requirements of crops to be grown, the quantitative measurements of proper soil properties, and the use of these data into an equation are essential for the design of a drainage system. The purpose of this article is to present a sound procedure for the determination of the appropriate depth and spacing of tile drains, in view of the soil characteristics and the desired rate of draw-down of the water table. The procedure accounts for the effect of convergence of flow towards the drains and avoids the common assumption of water-bearing stratum of constant thickness even though the procedure was based on the Dupuit-Forchheimer theory. A similar procedure that did not use these two features were compared.

REFERENCE: Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, June 1963, pp. 1-11.

154. DETERMINING SOIL PROPERTIES
CHAPTER 23

by

Herman Bouwer and R. D. Jackson

This report presented a description of techniques and formulas used to determine a number of physical soil properties. The properties discussed were hydraulic conductivity, fillable pore space, unsturated hydraulic conductivity, the soil-water pressure head, the volumetric water content, water-table position and the oxygen diffusion rate. The significance of these properties is that they are used for such things as calculating drain spacing, water content distribution, and for determining the soil aeration status in drainage response studies.

REFERENCE: Drainage for Agriculture, Vol. 17, 1974, pp. 611-672.

155. DIFFERENTIAL RESPONSE OF SOYBEAN VARIETIES TO SOIL CADMIUM

by

Sam F. Boggess et al.

Cadmium exhibits a higher capacity of toxic agents among redistributed trace elements. From the results of differing toxics found in cadmium, plants show a variety of displaying adsorption and exhibiting. It has not been comprehensively proven that cadmium uptake and/or susceptibility can have differing varieties in one plant. A certain amount of prominent soybean selections were grown and tested for cadmium from sewage sludge applied soils. Cadmium toxicity symptoms varied from a color range of red to purple and included severe leaf curling. When cadmium increased, the dry weight in the soil decreased. Three different cadmium chloride soils applied respectively were found to correlate with one another and likewise with relating cadmium concentrations from soils amended with sewage sludge. The mature soybean did not correlate with visual affects, dry weight decrease or cadmium densification. Dunfield, Harosoy, Arksoy, Dare, Flam beau, and Scioto were largely acceptable to cadmium chloride amended soils. Clark, Mukden, Mandarin and Lee were less susceptible.

REFERENCE: Agronomy Journal, Vol. 70, September-October 1978, pp. 756-760.

For article on related subject see No. 14.

156. THE DISTRIBUTION AND NATURE OF ARSENIC IN THE SOILS OF THE BATHURST, NEW BRUNSWICK DISTRICT

by

E. W. Presant and W. M. Tupper

Total arsenic was found in the levels of 20 podzol soil profiles with mean values ranging from 2 ppm in A_0 horizons above non-mineralized bedrock to 1,270 ppm in the C horizon over sulfide deposits.

The amount of arsenic associated with the 0.1 N HCI soluble, organic and free iron oxide fractions was found in the horizons of six profiles, arsenic demonstrated little tendency to combine with humus near the surface. Arsenic tended to concentrate in the B horizons linked with the secondary iron oxides. It was deduced that there was a probable arsenic-sulfide relationship from the high total arsenic values found in the lower horizons above sulfide deposits. A more reliable measure of sulfide deposits can be found in the B or horizons rather than in the A_2 horizons.

REFERENCE: Economic Geology, Vol. 61, 1966, pp. 760-767.

157. AN ECOLOGICAL SURVEY OF HYDROCARBON-OXIDIZING MICRO-ORGANISMS

by

J. G. Jones and M. Ann Edington

A two year survey was completed over microflora from upland moorland soil and underlying shale. Some of the samples were taken from depth of 5, 20, and 40 cm. Samples of hydrocarbon-oxidizing organisms were present in all tests occurrences. Twenty cm of the higher proportion of the population was capable of utilizing hydrocarbons as sole energy and carbon source. Hydrocarbons were capable of stimulating respiration in all the samples. E_h was least effected when compared to the other samples. If the level of hydrocarbon oxidation is on a high level, there is a level of lipid and hydrocarbons present. The adaptation of microbial populations can also raise the level of hydrocarbons oxidation. Oxidization in the longer chain n-aliphatic hydrocarbons rather than short chains reacted in the organisms.

REFERENCE: Journal Gen. Microbial, Vol. 52, 1968, pp. 381-390.

158. THE EFFECT OF ACID MINE WATER ON FLOODPLAIN SOILS IN THE WESTERN KENTUCKY COALFIELDS

by

R. L. Blevins et al.

The effect of acid mine water on soils and plant growth was tested under laboratory and greenhouse conditions. An increase in the acidity level of soils as a result of high aluminum ion concentrations proved harmful to plant growth. Treatment of polluted soils was most efficiently accomplished by soil amendments of both lime and phosphorus. Treatment of land which has been contaminated with such wastes includes: 1. an adequate drainage system, 2. prevention of further contamination, and 3. the application of fertilizers and soil pH adjusters such as lime.

REFERENCE: Soil Science, Vol. 110, No. 3, October 24, 1969, pp. 191-196.

159. THE EFFECT OF ANIONIC AND NONIONIC DETERGENTS ON SOIL MICROFUNGI

by

Benny K. H. Lee

A comparison was made between the effects of anionic and nonionic detergents when used as a carbon source for several types of fungi. Different concentrations of each detergent were tested. The anionic type showed greater availability of carbon and possibly nitrogen as well as caused a lesser amount of growth inhibition of the fungi. Several other various characteristic changes of the fungi were altered by both types of detergent.

REFERENCE: Canadian Journal of Botony, Vol. 48, 1970, pp. 583-589.

160. THE EFFECT OF ARSENITE OF SODA ON THE SOIL

by

W. T. McGeorge

For a number of five years, Hawaii has used arsenite of soda as a spray to kill weeds. Through intense and extensive studies, this arsenite is thought to have an indefinite affect. The use of the arsenite was most effective, and the cost was rather cheap. The arsenite of soda was prepared in two forms; one being of acidic type and the other neutral sodium arsenite. These proved to be most effective on killing weeds, but plant growth was effected in turn by the poison. Water movement was haulted within the soil causing an altered state of the soil. In conclusion, the tests showed heavy amounts of rains did not remove the arsenite of soda that had accumulated over the years. There is no danger from using the arsenite to kill weeds, but to be aware not to use it in large amounts.

REFERENCE: Hawaii Agricultural Experimental Station, June 10, 1915, pp. 1-16.

161. EFFECT OF CALCIUM AND ORGANIC MATTER ADDITIONS ON THE UPTAKE OF RADIOSTRONTIUM AND RADIUM BY PLANTS FROM INDIAN SOILS

by

K. B. Mistry and B. M. Bhujbal

This experiment studied the effects of calcium and organic matter on radium and radiostrontium uptake in maize. Concurrent incubation experiments were used to study changes in pH and exchangeable calcium in soils while a water culture experiment presented the effects of organic matter on strontium-89 uptake by plants. Liming was found to be beneficial in reducing plant uptake by nuclides as well as increasing the exchangeable calcium level in the soil. Applications of compost resulted in decreased amounts of Sr-89 taken from the soil by maize plants. Applications of polysaccharide fraction of compost was found to significantly lower radionuclide availability to plants.

REFERENCE: Agrochemical, Vol. 18, December 1973-February 1974, pp. 173-183.

162. THE EFFECT OF CALCIUM ARSENATE UPON THE PRODUCTIVITY OF SEVERAL IMPORTANT SOILS OF THE COTTON BELT

by

Clarence Dorman et al.

This study tested the effects of various amounts of calcium arsenate on seven different soil types. Calcium arsenate, which is used as an insecticide, caused no adverse effects on any type of plant growth, nor did accumulations of the substance occur until extremely large amounts were applied to the soil. The most sensitive soils were sandy loams containing comparatively low levels of clay, iron, aluminum, calcium and magnesium. The conclusion reached was that the amounts of calcium arsenate required for insecticide purposes should not promote harmful concentrations.

REFERENCE: Journal of the American Society of Agronomy, Vol. 31, pp. 1020-1028.

163. THE EFFECT OF SOIL MOISTURE CONTENT UPON THE UPTAKE OF MOLYBDENUM, COPPER, AND COBALT BY ALSIKE CLOVER

by

Joe Kubota et al.

Four soils were tested for the effect molybdenum, copper, and cobalt would have on the moisture level on the uptake of Alsike Clover. These soils were potted respectively in nine pots. The first three pots containing soil for dry treatment, three more for wet treatment, two for border pots, and one for continuous study of desorption on growing plants. Wet soil conditions increased the molybdenum and cobalt concentration in the soil solution and plant. After four cuttings, Alsike Clover was shown to increase the cobalt level on the two Brown Podzolic soils, but not on the Nevada soils. The soil wetness did not cause the copper contents to differ in the plants.

Suggested from this information is the need to investigate poorly drained soil. Molybdenum toxicity in the livestock could occur. Also, forage may differ due to the soil wetness causing poor forage. It is emphasized that this poor forage might be improved with better drainage conditions. This could also lower the cobalt content in certain soils containing forage plants.

REFERENCE: Soil Science Society Proceedings, Vol. 27, 1963, pp. 679-683.

For article on related subject see No. 27.

164. EFFECT OF SOIL PH AND TEXTURE ON THE AVAILABILITY OF WATER-SOLUBLE BORON IN THE SOIL

by

John I. Wear and R. M. Patterson

The main purpose of this paper was to determine the effects of soil texture and soil pH on the relationship between water-soluble B extracted from the soil, and the B uptake by the plant, alfalfa. The experiment was conducted with Norfolk sandy loam, Hartsells fine sandy loam, and Decatur silty clay. These represented a coarse, medium, and fine-textured soil. The treatments included five rates of B at three pH levels. The soils were analyzed for water-soluble B and pH after the plants were harvested. Plants from the fine-textured soil had the least uptake of B per unit of water soluble B in the soil, and alfalfa that was grown on coarse-textured soil had the highest uptake. The medium-textured soil was found to be intermediate. This work shows that of Southeastern soils, the soil texture and pH are important factors in evaluating boron availability. It was found that water-soluble B content of soil is a good indicator of available plant B as long as soils of similar texture and close pH values are compared.

REFERENCE: Proceedings of Soil Science Society of America, Vol. 26, 1962, pp. 344-346.

165. EFFECT OF SOIL PROPERTIES ON THE ACCUMULATION OF STRONTIUM-90 AND CESIUM-137 IN CROPS

by

M. A. Abbazov et al.

Uptake of strontium-90 and cesium-137 through wheat and rice from different soil groups of Uzbekistan was studied in pot experiments. The uptake of radionuclides was highest from the sandy desert soil. Uptake of strontium-90 depends on exchangeable calcium content in the soil and cesium-137 on the content of exchangeable potassium and clay. The soil humus content had a decreased effect with uptake of radionuclides by crops.

REFERENCE: Soviet Soil Science, Vol. 10, 1978, pp. 52-56.

166. EFFECTS OF GALLIUM AND INDIUM ON THE GROWTH OF CITRUS PLANTS IN SOLUTION CULTURES

by

George F. Liebig et al.

As a part of a general citrus nutritional investigation, the effects of gallium and indium were studied. Culture experiments were carried out on citrus plants to determine both the essentiality of the chemicals to growth, and the order of toxicity in plants. Several concentrations of the elements were applied. This resulted in no significant top growth, but a slight stimulation of the root system. The order of toxicity was found to be similar to that of aluminum. Like other metals, the seat of toxicity was in the cortical region of the root system. It was concluded that only trace amounts of the elements tested were required for plant requirements and functions.

REFERENCE: Soil Science, Vol. 56, 1943, pp. 173-185.

For article on related subject see No. 16.

167. EFFECTS OF SURFACTANTS APPLIED TO SAMPLES OF SOLONETZ SOIL ON WATER PENETRATION AND PLANT GROWTH

by

R. R. Cairns

Several surfactants were applied to Solonetz soils to determine their effects on water permeability and plant growth. Soil permeability after applications of surfactants was inconsistant, except for ammonium nitrate which was steadily increased. Plant growth was inhibited with the surfactant in some cases causing toxic effects such as discoloring and reduced growth.

REFERENCE: Canadian Journal of Soil Science, Vol. 52, June 1972, pp. 267-269.

168. EFFICIENT AMENDMENT USE IN SODIC SOIL RECLAMATION

by

R. J. Prather et al.

A laboratory column study of sodic soil reclamation was used on two soils with high (Sodium exchangeability percentage (ESP)) and high (Cation exchange capacity (CEC)). The soils were amended with sulfuric acid, calcium sulfate, calcium chloride (singly and in combination) to test amount of amendment, time, and needed leaching. Singly, sulfuric acid is more effective than calcium sulfate and has a more desirable (ESP) than calcium chloride. When calcium chloride (at ¼) proportion or sulfuric acid (at 3/4) are combined with calcium sulfate, time and leaching are reduced with respect to calcium sulfate alone. Certain soil conditions prevent or make the use of calcium sulfate undesirable alone. Amendment conditions can save amendment cost and do provide effective reclamation.

REFERENCE: Soil Science Society of American Journal, Vol. 42, 1978, pp. 782-786.

169. ENDEMIC GOITRE, THE FACTORS CONTROLLING IODINE DEFICIENCY IN SOILS

by

S. R. Aston and P. H. Brazier

Endemic goitre, which can result from an iodine deficient diet, often occurs in regions of relatively young glacial soils as in this area of study in Northwest England. Although the area is small, the parent rock sources differ greatly, and the soils are young. When tested, the soils and parent rocks were found to vary in iodine concentrations from 0.4 to 2.5 ppm. The input by rain wash out of atmospheric iodine from marine arosols is less than 0.35 micro grams/cm^2 per year.

The study revealed a strong correlation between iodine and organic carbon concentrations. Iodine retained through vegetative decay in a maturing soil was found to be much greater than iodine derived from parent rock or from atmospheric iodine.

REFERENCE: The Science of the Total Environment, Vol. 11, 1979, pp. 99-104.

170. FACTORS AFFECTING DIMETHYLNITROSAMINE FORMATION IN SAMPLES OF SOIL AND WATER

by

A. L. Mills and M. Alexander

The formation of dimethylnitrosamine (DMNA) in soil, sewage, and lake water was studied. Nitrosation was significantly decreased by either organic matter removal or increasing pH factors. The addition of glucose and microorganisms to the soil samples caused the formation of complex organic matter which is important for the nitrosation reaction.

REFERENCE: Journal of Environmental Quality, Vol. 5, No. 4, 1976, pp. 437-440.

171. FACTORS AFFECTING THE MOLYBDENUM CONTENT OF PASTURE PLANTS: I. NATURE OF SOIL MOLYBDENUM, GROWTH OF PLANTS, AND SOIL PH

by

Isaac Barshad

California soils found with excessive amounts of molybdenum had three basic parts present. First, a soluble molybdate salt, maybe a molybdate anion, and possibly soil organic matter. The most effective means used to control the water-soluble soil molybdenum was through growth and removal of excessive molybdenum plants. The concentration of molybdenum in a plant was discovered to correlate with the rate of growth in a plant. During show growth, molybdenum begins to increase with aging of the plant. Two plant species were analyzed, and the molybdenum content was closely proportional between molybdenum uptake and water-soluble molybdenum pH ranging from 4.7 to 7.5. A suppressive effect took place when the pH was above 7.5.

REFERENCE: Soil Science, Vol. 71, 1951, pp. 297-313.

For article on related subject see No. 28.

172. FACTORS AFFECTING THE MOLYBDENUM CONTENT OF PASTURE PLANTS: II. EFFECTS OF SOLUBLE PHOSPHATES, AVAILABLE NITROGEN, AND SOLUBLE SULFATES

by

Isaac Barshad

Molybdenum ion uptake in plants was stimulated by soluble phosphates, particularly in acid soils. Molybdenum ion uptake was retarded by available nitrogen (ammonium).

Molybdenum content was increased when soluble soil carbonates and hydroxyl ions were decreased by treatment with gypsum, sulfuric acid, or sulfur. Enhancing or retarding molybdenum uptake was explained as resulting from soil effect in conjunction with plant physiological response. Means were suggested for producing permissible molybdenum content plants from high molybdenum content soils.

REFERENCE: Soil Science, Vol. 71, 1951, pp. 387-398.

173. FACTORS AFFECTING THE MOLYBDENUM STATUS OF SOILS
CHAPTER 7

by

N. J. Barrow

The status of molybdenum in soil depends on both distribution and molybdate present in the soil. During adsorption, a reaction between molybdate and atoms result on the surface of the soil. It is beneficial to the mobility of molybdenum if the soil is high in iron and aluminum. Maximum adsorption for molybdenum is close to four when coinciding with the pH of an equal amount of acid. Adsorption reduces greatly when pH is higher than four. It is important to be able to measure adsorption due to the importance of molybdate fertilizers, and by doing so, one could prevent or overcome deficiency. Adsorption can be measured by shaking molybdate solutions with soil or measuring on a constant solution concentration. The level of molybdenum on a long-term is based on how long and how much change absorbed molybdate has on firmly-held forms. A high temperature, for example, can cause rapid change, low concentration of molybdate solution, and decreases how much gets to the plants. Soils do not affect the reactions of the solution. It is, therefore, subject to question whether the application should meet or exceed initial requirements. It depends on the level of application and adsorption.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 583-596.

174. FLUORINE IN AGRICULTURAL SOILS OF SOUTHEASTERN PENNSYLVANIA

by

Lawrence Gilpin and Arthur H. Johnson

From the Berk, Chester, and Montgomery county area, 55 soil samples were taken and measured for amounts of fluorine. Mean total, soluble, and resin-extractable fluorine were measured. Overall, fluorine in these soils was shown to be mostly immobile, insoluable, or not exchangeable or fixed.

REFERENCE: Soil Science Society of American Journal, Vol. 44, 1980, pp. 255-258.

For article on related subject see No. 30.

175. GEOCHEMISTRY AND SAMPLING OF MOLYBDENUM IN SEDIMANTS, SOILS, AND PLANTS IN COLORADO
CHAPTER 4

by

Donald D. Runnels et al.

Colorado offers interesting systems for studying the release of molybdenum from large point sources. Most natural releases are masked locally by mining and milling ores of molybdenum. The -80 mesh fraction of stream sediments or soils offer minute details and help in finding abundant sources of molybdenum. In the stream sediment and adjacent soils, the fundamental concentrations in the -80 mesh were in a range of 1 to 6 ppm. Most concentrations of molybdenum in waters across the state are below 10 ppm. Research has proven the concentration level of molybdenum depends on the pretreatment of sediments and their size before releasing them into the distilled water. A concentration of 800 ppm molybdenum in acidic ground water showed levels below 200 ppm dissolved molybdenum. Statistics from sediments taken from two different types of streams showed a single sample of sediment can serve as a dependable indication of the population mean at a site.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 386-423.

176. HETEROTROPHIC NITRIFICATION IN SOILS-- A PRELIMINARY INVESTIGATION

by

C. T. I. Odu and K. B. Adeoye

From teak soil, isolated heterotrophic organisms were tested in glucose-peptone medium, soil organic matter extract and sterilized soils. Isolates were tested as to their ability to produce nitrites or nitrates. The amounts of nitrogen produced varied with the medium used. Nitrate/nitrite production was more common and efficient among the fungi, in which up to 4.76 ppm nitrite and 12.88 ppm nitrate were produced after 14 days incubation.

REFERENCE: Soil Biology Biochemistry, Vol. 2, 1970, pp. 41-45.

177. INFLUENCE OF SOIL TYPES ON THE MINERAL COMPOSITION OF CORN TISSUES AS DETERMINED SPECTROGRAPHICALLY

by

Arthur L. Prince

This study determined the influence of soil type on chemical composition of corn plants and ragweed plants. The procedure was conducted using spectrographical techniques to determine quantitative and semi-quantitative amounts of a number of elements. Both trace and major elements were tested for. Included in the report are supplying powers of each soil used, and information dealing with the distribution of each substance in the plant tissue.

REFERENCE: Soil Science, Vol. 83, 1957, pp. 399-405.

For article on related subject see No. 3.

178. THE MAINTENANCE OF GRASSLAND ON SMELTER WASTES IN THE LOWER SWANSEA VALLEY
II. COPPER SMELTER WASTE

by

G. T. Goodman and R. P. Gemmell

Testing with applications of organic materials and pulverized fuel ash on copper smelter waste on grasslands was conducted in the lower Swansea Valley in 1965 and was monitored until 1970. A decline in pasture growth was attributed to the recurrence of copper toxicity despite annual application of fertilizers.

A 22.5 cm covering of pulverized fuel ash was the most successful treatment in the longterm, followed annually by NPK fertilization. Some successful short-term treatments were applications of 5 cm layers of sewage sludge or domestic refuse, or 7.5 and 15.0 cm layers of pulverized fuel ash.

REFERENCE: Journal of Applied Ecology, Vol. 15, 1978, pp. 875-883.

179. METAL INTERRELATIONSHIPS IN PLANT NUTRITION I. EFFECTS OF SOME METAL TOXICITIES ON SUGAR BEET, TOMATO, OAT, POTATO, AND MARROWSTEM KALE GROWN IN SAND CULTURE

by

E. J. Hewitt

The effects of various metals on sugar beets, tomatoes, potatoes, oats, and kale were determined. A number of symptoms such as chlorosis, necrosis, banding, disfiguration of the lamina, and iron and manganese deficiency were discovered in the plants as a result of the application of metal concentrations. Results showed that heavy metal other than manganese may cause a greater degree of iron deficiency. Magnesium deficiency was apparent with the additon of nickel, zinc, and cobalt. This suggested that heavy metal excesses may result in other micronutrient deficiencies, particularly the extent of manganese metabolism.

REFERENCE: Journal of Experimental Botany, Vol. 4, February 1953, pp. 59-64.

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180. MICRONUTRIENT CATION COMPLEXING IN SOIL SOLUTION: II. COMPLEXING OF ZINC AND COPPER IN DISPLACED SOLUTION FROM CALCAREOUS SOILS

by

J. F. Hodgson et al.

Among deficiencies, zinc deficiencies are more prevalent than copper deficiencies when located in calcareous soils. Various amounts of calcareous soil was selected from Colorado, and zinc level in the solution was 2 ppb less, and 75% of the zinc was complexed. Compared to copper, the average level was between 5 and 16 ppb. Some 98 to 99% of the copper was found as having organic complexes. In comparing this study of calcareous soil to acid soil, the zinc level was lower than copper complexes in calcareous soil.

REFERENCE: Soil Science Society America Proceedings, Vol. 30, 1966, pp. 723-726.

181. MOBILE SYSTEM FOR EXTRACTING SPILLED HAZARDOUS MATERIALS FROM EXCAVATED SOILS

by

Robert Scholz et al.

A transportable system for cleaning contaminated soil from a hazardous material spill or toxic waste disposal site is being developed for practical field use. This device can operate with water alone or with added extraction chemicals to scrub a wide range of soils and chemical contaminants returning the soil to a clean state.

REFERENCE: Environmental Energy Technology Center, No. 074, pp. 1-17.

182. A NEW APPROACH TO THE PROBLEM OF PLANT NUTRITION AND FERTILIZER REQUIREMENT. PART I.

by

Marcel V. Homes

The value of a nutrient formula is impossible to define only on the basis of the nitrogen-phosphorus-potassium balance; therefore, a more realistic and useful method would incorporate balances of all nutrients, anionic and cationic balances, and proportions of both in relation to yield. The theory of these calculations and preliminary results are discussed here in Part I.

REFERENCE: Soils and Fertilizers, Vol. 18, No. 1, 1955, pp. 1-4.

183. NICKEL AND CHROMIUM TOXICITY OF SERPENTINE SOILS IN SOUTHERN RHODESIA

by

B. D. Soane and D. H. Saunder

Soils in Southern Rhodesia were found to have extremely high levels of nickel and chromium when located of the infertile soils where found around serpentine rocks. Plants involved in the study were maize, tobacco, and oats. Correlation between exchangeable nickels and nickel concentration found in the same location were very similar. Infertility found in various soils was traced toward nickel. Testing of toxicity intensity by increasing pH to 8.2 provided information concerning nickel uptake and toxic symtoms and proved there was not an elimination of toxicity. Toxicity of soil and the infertility of the soil seem to link together, but this system seems to be complicated by other interceding parts such as calcium, chromium, and phosphorus found in the soil-plant system.

REFERENCE: Soil Science, Vol. 88, 1959, pp. 322-330.

184. NON-SYMBIOTIC NITROGEN FIXATION IN SOIL AND SOIL-PLANT SYSTEMS

by

A. W. Moore

More and better controlled research needs to be done on non-symbiotic nitrogen fixation: possible fixation by higher-plant tissues or enzyme reactions, letter as a fixation seat, blue-green algae fixation in non-humid soils, seasonal changes in soil nitrogen and plant root interactions in non-symbiotic fixation. 15_N is suggested for use as a tracer, closed systems and good Kjeldahl procedures to more clearly study this non-symbiotic fixation of nitrogen.

REFERENCE: Soils and Fertilizers, Vol. 29, No. 1, 1966, pp. 113-128.

185. PERSPECTIVES ON MOLYBDENUM IN SOILS AND PLANTS
CHAPTER 1

by

W. H. Allaway

Research on molybdenum found in soils and plants was conducted in a manner of highly international and interdisiplinary processes. World scientific literature seems to have been the major support behind corrdinating the research. Contributions of high significance have come from many different research approaches concerning molybdenum in plants and soils. Controlled experiments are beneficial in using highly purified cultures, accurate approaches to isolating enzymes and securing reactions of molybdenum with soils. More important is observing how and where plants produce productively in field locations. The study of soil morphology and collection of sediments from creeks and streams has increased knowledge concerning molybdenum concentration of the soil. The information gathered from research also provides knowledge for deficiency in plants and of the occurrences of soils lacking in available molybdenum. Another benefit is locating areas of high molybdenum plants. Biochemical reactions in plants and microorganisms give explanations of plant symptoms for deficiencies of molybdenum. Research has helped find the reactions of molybdenum in soils and geographic occurrences of deficiency in plants and toxicity in plants.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 317-339.

186. PHOSPHORUS RETENTION IN COASTAL PLAIN FOREST SOILS: I. RELATIONSHIP TO SOIL PROPERTIES

by

R. Ballard and J. G. A. Fiskell

Forty-two forest soils from the U.S. southeastern coastal plain were tested for phosphorus-retention capacity. The adsorption maximum was determined by saturation and the Langmuir isotherm. The range in retention was from 0-1,288 μg P/g soil. Although there was a considerable overlap between soil orders, the spodosols were usually the lowest in retention capacity. Many soil properties were correlated with phosphorus retention, and, except for clay, the reaction was indirect through the extractable aluminum. Aluminum and iron were found to be the best extractables of phosphorus retention. 1N NH_4 OAc was the most successful of aluminum extracts for phosphorus. The most successful for iron extracts of phosphorus retention was 0.3M. The order of activity found in phosphorus retention was exchangeable > amorphous > crystalline, with little difference between iron and aluminum. Aluminum was primarily a greater contributer than iron because of its greater amount in active forms.

REFERENCE: Soil Sciences Society of American Proceedings, Vol. 38, 1974, pp. 250-255.

For article on related subject see No. 107.

187. POLYCYCLIC AROMATIC HYDROCARBONS IN THE ENVIRONMENT: HOMOLOGOUS SERIES IN SOILS AND RECENT MARINE SEDIMENTS

by

W. W. Youngblood and M. Blumer

Polycyclic aromatic hydrocarbons are contained in solid and marine sediments. A remarkable uniformity is observed in molecular weight distribution. It is suggested that natural fires form and that air currents disperse a complex PAH assemblage; analytical, geochemical and environmental implications are given.

REFERENCE: Ceochimica et Cosmochimica Acta, Vol. 39, 1975, pp. 1303-1314.

188. PROGRESS REPORT ON THE CONTROL OF ZINC TOXICITY IN PEAT SOILS

by

E. V. Staker

Soils of western New York were tested to see if some alleviation could be done on the toxic effects of zinc. Four various soils were chosen with different levels of zinc ranging from 0.43 to 10.16 percent zinc concentrate. Spinach and onions were chosen for treatment. Sufficient amounts of sodium hydroxide with a pH value of 7.0 was the most efficient in growth with spinach. However, the yield was half in this experiment compared to normal productive soil. In spinach and onion, the highest yield was in calcium hydroxide at the rate of four tons per acre. Calcium hydroxide nor sodium metaphosphate did anything toward increasement of productivity when the soils had large amounts of zinc. Liming or leaching with acid to original pH was a failure in improvement to the soil productivity.

REFERENCE: Soil Science Society Proceedings, Vol. 7, 1942, pp. 387-392.

189. SEMIQUINONE CATION ADSORPTION ON MONTMORILLONITE AS A FUNCTION OF SURFACE ACIDITY

by

Charles G. Dodd and Satyabrata Ray

This study determined the effects of varying pH on the adsorption of semiquinone ions by clay soil. Calculations were made from data gathered on the amount of nitrogen adsorbed at each pH level. As pH levels increased, the amount of nitrogen also increased, especially as the pH approached the neutral level. Calculated values were lower than actual values unless an allowance was made for nonabsorbed free base and base lost during filtration.

REFERENCE: Clays and Clay Minerals Proceedings, 8th National Conference on Calys and Clay Minerals, Vol. 8, 1959, pp. 237-251.

For articles on related subject see Nos. 7 and 114.

190. SOIL ORGANIC MATTER-METAL COMPLEXES: I. FACTORS AFFECTING RETENTION OF VARIOUS CATIONS

by

F. E. Broadbent and J. B. Ott

Three types of soil were used to find the condition from which they formed with metals. Upland, meadow, and peaty muck were the soils selected for the study. Using spectrophotometrics, formation of chelate was spotted in a copper sulfate. Samples in organic matter could form complexes with the cations being from a very dilute substance. This all depended on the time of contact, the conditions, and the pH level.

REFERENCE: Soil Science, Vol. 83, No. 6, June 1957, pp. 419-427.

191. SOLUBILITY OF MANGANESE, IRON, AND ZINC AS AFFECTED BY APPLICATION OF SULFURIC ACID TO CALCAREOUS SOILS

by

J. Ryan et al.

This procedure studied how the solubility of manganese, iron, and zinc in calcareous soils were affected by the application of sulfuric acid. The study was more specifically concerned with using the acid as a soil amendment to increase the micronutrient availability. Sulfuric acid was found to increase the availability of iron and manganese in deficient soils. This, in turn, would evoke a positive plant response, but the level of sulfuric acid added should remain below the acid-titratable basicity (ATB) to prevent the soil from becoming acetic. The most feasible methods proposed for this type of application were found to be band application and spot treatment.

REFERENCE: Plant and Soil, Vol. 40, 1974, pp. 421-427.

192. THE SOLUBILITY OF MOLYBDENUM IN SIMPLIFIED SYSTEMS AND AGUEOUS SOIL SUSPENSIONS

by

L. H. P. Jones

Molybdate precipitation by iron or aluminium shows a definite relation between minimum solubility, pH, sorption, and concentration of molybdate in solution. Ferris and aluminium molybdate, molybdate sorption by simple solids, pH effects, concentration effects, the nature of molybdate solids, molybdate sorption by soils, and concentration effects are all detailed in this report.

REFERENCE: Journal of Soil Science, Vol. 8, No. 2, 1977, pp. 313-326.

193. SOLUBLE ALUMINUM STUDIES: I. THE CONCENTRATION OF ALUMINUM IN THE DISPLACED SOIL SOLUTION OF NATURALLY ACID SOIL

by

W. H. Pierre et al.

A selection of thirty soils representing acid soils was taken for a series of tests. Aluminum contents and hydrogen contents were selected along with ions and salts to be used in various studies. The concentrations of the aluminum varied from 1.5 to about 12 ppm with the pH level ranging from 4.0 to 4.9. Data from the tests showed a high concentration of anions, chlorides and sulfates maintained a high level of aluminum from the soil solutions. Soils having high organic matter though produced low amounts of aluminum. Studies using a curvilinear method showed 88% of the variance of aluminum came from variance in hydrogen-ion concentrations. Leaching was found most affective in decreasing the aluminum concentration in aluminum soils. It has been discovered from these experiments that there are other methods that can be used to find the solubility curve for the aluminum concentration. This was just one test emphasized for this test.

REFERENCE: Soil Science, Vol. 34, 1932, pp. 145-160.

194. THALLIUM POISONING AND SOIL FERTILITY

by

S. C. Brooks

Thallium toxicity in the soil was found in the immediate area where thallium sulfate had been used for vermin control. The small areas affected had no plant growth and showed no type of recovery over the following two years. Areas treated with thallium compounds may result in: 1. harmful effects to plants, 2. potential erosion hazards, and 3. soil sterility.

REFERENCE: Science, Vol. 75, No. 1934, January 22, 1932, pp. 105-106.

For article on related subject see No. 18.

195. THE TITANIUM CONTENT OF HAWAIIAN SOILS AND ITS SIGNIFICANCE

by

G. Donald Sherman

The Hawaiian Island soils were gathered to identify typical soils found there. A test was run for the purpose of determining the content of titanium oxide. A study on soil formation in connection with titanium oxide was completed. The results showed Hawaiian soils had a range of 2.5 to 25% titanium oxide. The higher surface soil which is exposed more toward the wet and dry seasons contained a large amount of titanium oxide. Humic Ferruginous Latosol soils contained the greatest amount of titanium which was in wet and dry seasons, but also was adjacent to the tropical rain forest. Titanium and iron oxides were found to gather under the same conditions in tropical soils. Dehydration forms concretions when near the surface. Titanium oxide tends to dehydrate the resist reduction more when compared to iron oxides. Not until conditions are greatly reduced, will titanium be leached from the soil. Gibbsite is then resilicated to Kaolinite.

REFERENCE: Soil Science Society Proceedings, 1952, pp. 15-18.

196. TITANIUM IN SOME NEW ZEALAND SOILS AND PASTURES

by

H. O. Askew

This study was concerned with the presence of titanium concentrations in the soil. Concentrations of the soils tested varied considerably, but never exceeded a relatively low percentage. Bush-sick soils were a result of low titanium concentrations and occurred more often in sandy soils. Data also showed a correlation between the amounts of iron and titanium in that soils showing low titantium concentrations contained lower levels of iron.

REFERENCE: The New Zealand Journal of Science and Technology, December 1930, pp. 173-179.

197. TRACE-ELEMENT CONTAMINATION OF SOILS IN URBAN AREAS

by

D. Purves

Analysis of top-soils in urban areas with trace-element concentrations in mind showed much higher levels of copper, boron, lead, and zinc than is typical in average rural soil. The soils sampled contained twice the boron, four times the lead, five times the copper, and twenty times the zinc as rural soils. Contamination of zinc in urban areas appeared to be the most serious, while the other trace-elements are uncommon even in urban soils at toxic levels.

REFERENCE: Trans. 9th Int. Congressional Soil Science, Vol. 2, 1968, pp. 351-355.

198. TRACE ELEMENT SORPTION BY SEDIMENTS AND SOILS--SITES AND PROCESSES CHAPTER 5

by

Everett A. Jenne

It is suggested that the most significant part a clay-size mineral plays in a trace element sorption during transport is a mechanical substrate for the precipitation and flocculation of minerals. Consequently, the clay is relatively unimportant as a trace element sink. Any one of the trace element sinks may be quantitatively important as a repository for elements in given sediments. It depends on the abundance and reactivity of the various sinks, distribution, and the depositional environment. Evidence shows that important sinks are oxides of iron and manganese, sulfides, carbonates, and organic matters. Phosphates, iron salts, and the clays themselves are of lesser importance. The variety of sinks are understood by the reactions of the surface and structural properties. In conclusion, the nature and sediments are considered by evaluation.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 425-553.

199. TRANSPORT OF POTENTIAL POLLUTANTS IN RUNOFF WATER FROM LAND AREAS RECEIVING ANIMAL WASTES: A REVIEW

by

R. Khaleel et al.

Animal wastes deposited on land react as being the most degrading to the water during a water runoff. The extent of this study was performed on three samples of land. One being in a feedlot, another being on pasture or range land, and the third being from cropland and such. The climate, how the wastes were deposited, and management of the land were taken into consideration during the time of testing. The passage of nitrogen and phosphorus oxygen compounds were tested for the affect the wastes had on them during a water runoff. The affect on nitrogen and phosphorus did differ in time of application, depending on whether it was winter and spring, or in the summer and fall. Various things of importance like the method used in application of the wastes made a difference in the transporting of these nutrients. Little data has been received over this matter, but further research will be done.

REFERENCE: Water Research, Vol. 14, 1980, pp. 421-436.

200. USING ORGANIC WASTES AS NITROGEN FERTILIZERS

by

P. F. Pratt et al.

The use of organic nitrogen fertilizers has recently increased with the need to dispose of large quantities of animal waste and municipal sludge.

The rate of mineralization, or decay series, must be understood to determine the proper long term application of nitrogen to the soil. From this study the "Constant Input Approach" and the "Constant Output Approach" were developed to determine the rate of application needed to maintain a constant rate of mineralization.

With experimentation, the technique developed here could readily be applied to the use of organic fertilizers.

REFERENCE: California Agriculture, June 1973, pp. 10-13.

201. YIELDS OF COTTON AND OTHER CROPS AS AFFECTED BY APPLICATIONS OF SULFURIC ACID IN IRRIGATION WATER

by

P. D. Christensen and P. J. Lyerly

The year 1947 through 1952 crop yield was investigated for the effect sulfuric acid would have on it. Irrigation water used was treated with acid of a pH 6 to a pH 2.3. One other irrigation water contained no acid. Cotton and other crops in alkaline soils indicate an increase through soil acidification. Calcareous soils appear to have greater absorption or iron, manganese, and other nutritive elements. In another soil such as noncalcareous soil, when acid is applied, the results of yield are determined by the crop planted. Acid elements and sulfur applied to high calcareous soils show little or no value for application. The crops in this situation reveal no increase in yield. With the crop alfalfa, the yield reduces when irrigation water with acid or phosphoric or sulfur are applied. Economically, it is not truly feasible, although in some cases it increases crop yield.

REFERENCE: Soil Science Society Proceedings, Vol. 15, 1954, pp. 433-436.

202. AN APPROACH TOWARD A RATIONAL CLASSIFICATION OF CLIMATE

by

C. W. Thornthwaite

This article brings into view the role of evaporation and transpiration as vital environmental parameters that need attention when the overall climatic conditions of an area are being evaluated. The paper also relates temperature and growth and gives equations by which growth, moisture index, and evapotranspiration may be calculated. The accuracy of calculated evapotranspiration was tested and shown to be adequate.

REFERENCE: Geographical Review, Vol. 38, 1948, pp. 55-95.

203. DENITRIFICATION IN SOME TROPICAL SOILS

by

D. J. Greenland

A determination was made of the extent to which denitrification occurs in tropical soils and the effects on denitrification in inadequate energy supplying carbon compounds. Soils showed small nitrogen losses when unsaturated with glucose, while saturated samples exhibited more significant denitrification. Increased temperatures and lowered carbon demand makes nitrogen loss more probable for these type soils, but the lack of sufficient substrate for this process make it unlikely. Concern for soils in forested areas may, however, be warranted.

REFERENCE: Journal of Agricultural Science, Vol. 58, 1962, pp. 227-233.

204. THE DETERMINATION OF ATMOSPHERIC WATER MOVEMENTS

by

L. R. Holdridge

This report presents two methods by which the movement of atmospheric moisture can be analyzed. The first method involves using a graph called the nomogram to show water movement in the air. The second method utilizes a formula to determine evapotranspiration values. This formula exceeds the nomogram in performance in that it also provides data in edaphic and atmospheric associations from physiognomic characters.

REFERENCE: Ecology, Vol. 43, No. 1, Winter 1962, pp. 1-9.

205. OCCURRENCE OF SULFATE AND NITRATE IN RAINFALL

by

Arlo W. Gambell and Donald W. Fisher

Data from six thunderstorms were used to study the mineral composition of rainwater at Prince William National Forest Park, Virginia. The data support the supposition that much of the sulfate in rainfall forms from the oxidation of sulfur dioxide in cloud droplets. Nitrogen dioxide is thought to be a catalyst in this transfer and is, for this reason, very important. Indications from the data show the sulfate, nitrate and ammonia in rainfall stemmed predominately from gaseous constituents in the atmosphere. The origin of nitrate in thunderstorm rainfall is discussed. Data is presented to show that the role of lightning is negligible.

REFERENCE: Journal of Geophysical Research, Vol. 69, No. 20, October 15, 1964, pp. 4203-4210.

For article on related subject see No. 163.

206. SOIL TEMPERATURE EFFECTS ON UPTAKE OF CADMIUM AND ZINC BY VEGETABLES GROWN ON SLUDGE-AMENDED SOIL

by

P. M. Giordano et al.

The uptake on heavy metals were treated for the effect soil temperature would have on plants grown on sludge-amended soil. Uptake of zinc and cadmium on various vegetables were selected from Sango sil amended with anaerobically digested sewage sludge with 224 metric ton/ha. Soils taken in the selection were heated to around 27°C by a thermostatically regulated cable placed 30 cm into the soil and 30 cm across the soil. A measurement was then taken over edible plants possessing heavy metals during uptake. Levels of concentration in extractable metals did increase in the soil, but was not found in higher plant life. The heating of soil intensified the level of cadmium and zinc in broccoli and potato. The concentration of zinc and cadmium was higher in other plants, but not enough difference to note. Reducing the level of cadmium and zinc was done by liming, but better growth dilution justifies part of reduction. Tests did reveal a movement of up to 20 to 30 cm of zinc and cadmium.

REFERENCE: Journal of Environmental Quality, Vol. 8, No. 2, 1979, pp. 233-236.

207. SOIL TEMPERATURES

by

B. J. Fluker

Natural soil temperatures were measured on bare ground surface from a location at College Station, Texas. The data was from a testing of air and nine different ground surface depths to the depth of 10 feet. Annual temperature is observed at each level including effects of rainfall and resulting in a content change in soil moisture.

REFERENCE: Soil Science, Vol. 86, 1958, pp. 35-46.

208. VOLATILITY OF ORGANOCHLORINE INSECTICIDES FROM SOIL: I. EFFECT OF CONCENTRATION, TEMPERATURE, AIR FLOW RATE, AND VAPOR PRESSURE

by

W. J. Farmer et al.

Volatilization of dieldrin from Gila silt loam was treated in a laboratory at an air flow of 20C and 30C for influence of soil pesticide concentration. Lindane and DDT were compared with the volatilization of dieldrin from Gila silt loam for the influence of pesticide vapor pressure. During the volatilization process, no net water movement went to or from the soil. Vapor denisty was the controlling factor of the soil-applied pesticide volatilization rate of dieldrin increased with soil pesticide concentration until 25 μg/g was reached in soil dieldrin concentration. To have vapor density equivalent to a pure compound, this is required soil dieldrin concentration. By increasing the volatilization rate 10°, it increased the volatilization about fourfold. To increase the rate of volatilization twofold, the rate of air movement over the surface soil needs to increase from 0.005 to 0.018 mile/hour. The order of rate of volatilization is lindane > dieldrin > DDT. To increase the vapors, they must be in the same order of rate. The rate of volatilization was less in the insecticides than the vapors due to the concentrations of lindane and dieldrin. Losses of lindane, dieldrin and DDT at 202, 22, and 5 kg/ha/year caused decreased volatilization rates in the soil pesticide concentration. Laboratory data suggests the rate of volatilization accounts for pesticides lost in normal field conditions.

REFERENCE: Soil Science Society American Proceedings, Vol. 36, 1972, pp. 443-447.

209. ABIOTIC FACTORS AFFECTING THE TOXICITY OF LEAD TO FUNGI

by

H. Babich and G. Stotzky

Fungi exposed to the toxicity of lead in a pure culture was influenced by a variety of abiotic components. For example, pH, clay minerals, humic acid, and inorganic anions affected the toxicity toward the fungi. The lead toxicity increased in power when influenced by acidic conditions of 5 and 6 pH. Phosphate anions reduced toxicity presumably from formation of extra soluble lead salts. Parts of humic acid and clay minerals were protected from the poisons of lead, which lowered availability of fungi uptake. Other factors relating to reduction of toxicity of lead were soluble organics including yeast extract, cysteine, and succinic acid.

REFERENCE: Applied and Environmental Microbiology, Vol. 38, September 1979, pp. 506-513.

210. THE ABSORPTION OF ARSENIC BY BARLEY

by

S. H. Collins

This experiment was interested in explaining the absorption of arsenic by barley using potted plants. Because of unknown arsenic in the test soil, the only conclusion reached was that soils may contain unnoticed arsenic concentrations, and plants grown in such soils may contain the substance.

REFERENCE: Journal of the Society of Chemical Industry, February 28, 1902.

211. ABSORPTION OF CATIONS BY ROOTS. EFFECTS OF HYDROGEN IONS AND ESSENTIAL ROLE OF CALCIUM

by

D. W. Rains et al.

Research was conducted to determine how the growth and ecology of plants and the absorption of ions are affected by the pH of the soil and the activity of hydrogen ions in the soil cation exchange capacity. Two hypotheses were confirmed by the investigation. In instances of high or low pH values, the external solutions must compete with other ions for binding sites of ion carriers, thus the rate of ion absorption is reduced. In a low pH solution, injury to the ion absorption mechanism is caused by hydrogen ions.

REFERENCE: Plant Physiology, Vol. 39, 1964, pp. 274-278.

212. THE ACIDIFICATION OF ALKALINE NURSERY SOILS FOR THE PRODUCTION OF EXOTIC PINES

by

H. E. Young

This study was concerned with the growth of exotic pine trees in alkaline soils. Manure applications and attempts to introduce symbiotic fungus into the soil did not solve growth problems. Alkalinity was determined to be the primary detrimental growth factor. Sulfur and aluminum sulfate were tested for their ability to lower soil pH. Both agents accomplished the acidification, but aluminum sulfate was found to be toxic to plant growth when applied to adequate pH adjusting concentrations.

REFERENCE: Queensland Agricultural Journal, Vol. 1, November 1938, pp. 585-600.

For article on related subject see No. 136.

213. THE ADAPTATION OF FUNGI TO PENTACHLOROPHENOL AND ITS BIODEGRADATION

by

A. J. Cserjesi

In this study of fungi tolerance to pentachlorophenol, the association of adaptation or inheritance involved in pentachlorophenol degradation was investigated. Only one isolate of Cephaloacus fragrans was adapted to pentachlorophenol tolerance, but showed no ability to degrade. Three species of trichoderma did show an ability to degrade pentachlorophenol even in a short incubation period.

REFERENCE: Canadian Journal of Microbiology, Vol. 13, 1967, pp. 1243-1249.

214. AEROBIC CHEMOORGANOTROPHIC BACTERIA OF A DANISH BEECH FOREST MICROBIOLOGY OF A DANISH BEECH FOREST I.

by

Esther Holm and Vagn Jensen

This article contains information concerning the microbiological study of a beech forest ecosystem. This study was carried out in a Danish Forest.

The physical parameters of the study area were discussed as follows: mean height, mean diameter, area of standing crop, yearly increase in area of the stand, soil characteristics, leaf-burst and leaf fall.

Methods are described for the sampling of litter and surface soil, soil profiles, ground vegetation, and beech leaves. Physical and chemical analyses, qualitative studies, and plate counts were taken. From the plate counts, studies were made of the numbers of bacteria in the litter layer; and in the surface soil, the distribution of bacteria in the soil profile, the bacteria in the rhizosphere and phyllosphere of the ground vegetation, and the numbers of bacteria in the tree canopy were studied. From the qualitative studies, a classification was made of the bacteria found in the litter layer, soil bacteria, bacteria in the rhizosphere and phyllosphere of the ground vegetation, and bacteria in the tree canopy. From all the studies involved in this project, biomass calculations were made.

REFERENCE: OIKOS, Vol. 23, No. 2, 1972, pp. 248-260.

215. AGAR-PLATE METHOD FOR TOTAL MICROBIAL COUNT

by

Francis E. Clark

The agar-plate method is an empirical method for determining the microbial count of soil samples. This report gives the principles behind this method, and then goes through the procedures step by step to the final calculations. Hints are given to increase the accuracy of measurements such as leaving the soil sample in the same condition as is natural, and the proper way to withdraw samples from the soil dilution. Not following procedures carefully can result in high or low microbial counts, which may have been avoided.

REFERENCE: Methods of Soil Analysis, Part 2, 1965, pp. 1460-1466.

216. AGRICULTURAL AND HORTICULTURAL UTILIZATION OF FERMENTATION RESIDUES

by

Henry C. De Roo

Fermentation residues are the waste mediums produced by the making of some pharmaceutical drugs. In this report, these residues were studied as to there use in agriculture because of their relatively large percent nitrogen content. Greenhouse and field experiments were carried out over a two year period. These test were conducted on composting and stockpiling, and testing was conducted on these plants: chrysanthemum, juniper, oats, corn, tomatoes, rye, and tobacco. The results and conclusions are detailed therein.

REFERENCE: The Connecticut Agricultural Experiment Station, 1975, pp. 1-42,
Bulletin 750.

217. ALKANE DEGRADATION IN BEACH SANDS

by

T. E. Ahlfeld and P. A. LaRock

The rate of n-alkane degradation was estimated in beach sands from Coal Oil Point, California. Large samples of sand were taken from a beach consistantly polluted with oil from naturally-occurring seeps. These samples were analyzed gas chromatographically and gravimetrically for hydrocarbon content. Maximum degradation of n-alkanes occurs at a rate of 0.32 grams per day for 100 square meters of beach. An estimation of oil input was 5g/ $100m^2$/day. It is noted from these calculations that 6% removal of the alkane content occurs by means of oxidation, which includes bacterial degradation, evaporation, and autoxidation.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 199-203.

218. ALUMINUM TOXICITY SYMPTOMS IN PEACH SEEDLINGS

by

J. H. Edwards et al.

Aluminum toxicity symptoms in leaves and severely restricted root growth was induced in Elberta peach seedlings at an aluminum concentration of 2000 µM for 27 days. Toxicity in the early stages was characterized by marginal chlorosis that later developed into necrotic areas that extended along the veins toward the midrib. The collapse of the midrib, terminal dieback, and defoliation of the seedling showed the advanced stages of poisoning. The advanced stages of toxicity coincide with typical symptoms of calcium deficiency in peaches. Roots died and new roots developed as irregular-shaped cylinders with crimps and bulges at the end of the root at high aluminum concentrations.

REFERENCE: Journal of the American Society of Horticulture Science, Vol. 101, No. 2, 1976, pp. 139-142.

219. AMMONIUM AND NITRATE NITROGEN NUTRITION OF BARLEY AT DIFFERENT SEASONS IN RELATION TO HYDROGEN-ION CONCENTRATION, MANGANESE, COPPER, AND OXYGEN SUPPLY

by

D. I. Arnon

Methods were used to study the ammonium and nitrate nitrogen nutrition found in barley plants. The process was maintained during the different seasons, while pH levels between 5 and 6.7 were maintained. Most results showed a pH 6 level at its best during the fall season. Ammonium plants showed a large affect, which appeared positive with forced aeration. Other plants needed little or no aeration. The dry weight found in the ammonium plants was found to have increased 400% in shoots and 800% in roots. During experiments, portions of manganese and copper along with aeration were used as controls in the barley plants. Hydrogen-ion was only one of the concentrations used among the variables.

REFERENCE: Soil Science, Vol. 44, 1937, pp. 91-121.

220. AQUEOUS HEAVY METAL REMOVAL VIA WASTE BIOLOGICAL STUDIES

by

R. D. Neufeld and E. R. Hermann

This article describes a method of removing toxic heavy metals from a waste stream by contacting that stream with a biological activated sludge such as from sewage treatment. It was shown that zinc, cadmium, and mercury were quickly taken up from the waste stream by the biological floc. Three hours of contact was enough time to bring about almost complete equilibrium, and no incorrectable problems were found when this method was tested.

REFERENCE: Watereuse--Proceedings of the 2nd National Conference, 1975.

221. ARABIDOPSIS AS A GENETIC TOOL

by

G. P. Redei

This report presents a new organism, Arabidopsis, for use as a genetic tool. This plant has previously been used for the study of continuity of chromosomes. A number of advantages have been found for this species including plant size and nuclear make up. Arabidopsis appears to be advantageous to several aspects of genetics.

REFERENCE: Ann. Rev. Genet., Vol. 9, 1975, pp. 111-127.

222. ARSENIC COMPOUNDS TOXIC TO RICE

by

E. A. Epps and M. B. Sturgis

This study revealed that arsenic compounds can be toxic only if the compound is water soluble; thus, a flooded condition would cause toxic arsenic concentrations in the soil. Sulfur was added to soils with the above condition and a decreased plant intake of arsenic was shown along with improved crop growth. Soluble arsenic present in a soil is an index of arsenic toxicity. When soluble arsenic concentrations are greater than 0.2 ppm, injury due to arsenic poisoning can be expected.

REFERENCE: Soil Science Society Proceedings, Vol. 4, 1939, pp. 215-218.

223. ARSENIC INJURY OF PEACH TREES

by

R. C. Lindner

This report traced symptoms of peach trees to arsenic poisoning. The arsenic present in the soil is thought to have come from arsenic applications on apple trees previously grown on the land. Injections of dilute arsenic into uncontaminated trees showed similar symptoms. Sensitivity to arsenic concentrations varies among trees. Highly sensitive trees, such as peaches and apricots, may even be damaged by the natural arsenic content of some soils.

REFERENCE: American Society for Horticultural Science, 1943, pp. 275-279.

224. ARSENICALS IN BIOLOGY--RETROSPECT AND PROSPECT

by

Douglas V. Frost

The transition element, Arsenic--a metalloid, reacts readily with carbon, hydrogen, and oxygen and also forms alloys with metals. The use of arsenicals as a poison gave it an aura of mystery. However, all tissues contain very low levels of arsenic. In fact, organic arsenicals were found to improve health in several species. Vital tissues of most mammals can hold only small quantities of arsenicals (about 1 ppm). Arsenicals are ubiquitous. Water, soil, and air all contain measurable quantities of arsenicals. Arsenicals have mistakenly been thought to cause cancer in a number of forms. Arsenate has been found to be a catalyst in oxygen and phosphate transfer reactions. Arsenicals may cause thickening and densification of bones in animals and may be useful in dental health as an agent to reduce solubility of enamel.

The laws regarding the use of arsenic have evolved faster than scientific study and should be reconsidered.

REFERENCE: Trace Elements in Nutrition-Federation Proceedings, Vol. 26, 1967, pp. 194-208.

225. BACTERIAL DEGRADATION OF DETERGENT COMPOUNDS

by

Robert A. Goodnow and Arthur P. Harrison, Jr.

Surfactant degradation was tested on aerobic bacteria which was placed in a peptone medium. Tallow-alkyl, alkyl-ethoxylate, and linear-alkyl-benzene-sulfonates were used in this survey. A total of 19 genera and other strains and species were used in the process of degradation from the detergent compounds. In certain species, degradation was restrained while others had degradation in a toxic concentration.

REFERENCE: Applied Microbiology, Vol. 24, No. 4, October 1972, pp. 555-560.

For article on related subject see No. 46.

226. BACTERIAL DEGRADATION OF MINERAL OILS AT LOW TEMPERATURES

by

C. E. ZoBell

Thirteen samples of oil-polluted water, soil, and tundra much collected from the North Alaska Slope showed presence of psychrophilic oil-oxidizing bacteria. It could be seen that after a week or two, clear mineral oil was being degraded by bacteria at 8° and 4°C. After two to three weeks at -1.1°C, biodegradation became apparent. It was calculated by the uptake of oxygen that bacteria oxidized mineral oil at rates ranging from 0.13 to 0.9 mg/liter/day at -1.1°C. It was calculated that a population of 10^8 reproducing cells per ml of mineral oil medium would use oil for creating biomass at a rate of 1.2 mg/liter/day at -1.1°C based on the assumption that an over generation time was one day. Nine different types of crude were attacked by bacteria growing -1.1°C.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 153-161.

227. BACTERIAL DEGRADATION OF PETROLEUM MATERIALS IN LOW TEMPERATURE MARINE ENVIRONMENTS

by

R. W. Traxler

This report discussed the degradation of petroleum products by bacteria in low temperature marine waters. Samples taken were found to contain a wide variety of microorganism genera. The study was concerned with several factors including types of hydrocarbon-utilizing bacteria, types of hydrocarbons, effects of temperature of metabolism and rate of metabolism in certain given situations. Results showed that a type of bacteria could be isolated which readily utilizes a wide variety of hydrocarbons and implies that similar organisms may also be isolated.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 163-170.

228. BACTERIAL DEGRADATION OF POLYCHLORINATED BIPHENYLS II. RATE STUDIES

by

Paul T. Wong and Klaus L. E. Kaiser

Polychlorinated biphenyls were introduced into samples of lake water to determine their degradation of bacteria. No detrimental effects to the bacteria were noticed, while a slight growth stimulation occurred in two cases. Degradation did occur in most all cases; however, non-chlorinated biphenyls were degraded more rapidly than the polychlorinated types. This suggests that inhibition is caused by biphenyl chlorination. Degradation rates were also related to the position of the chlorine atom in the molecule.

REFERENCE: Bulletin of Environmental Contamination and Toxicology, Vol. 13, No. 2, 1975, pp. 249-256.

229. BACTERIAL UTILIZATION OF ANIONIC SURFACE-ACTIVE AGENTS

by

O. B. Williams and H. B. Rees, Jr.

This study covered application of bacteriology of surface-active agents. More often these agents were found in detergents. The bacteria usually survived under all the tests that were run with the same application of differing surface-active agents. Positive forms of grain bacteria and cationic types of appeared more sensitive to the surface-active agents. Gram-negative particles were tested, however, for growth on shampoo agar. Certain elements grew on the medium, while others grew in addition to the sodium lauryl sulfate medium. Pseudomonas fluorescens, Pseudomonas aeruginosa are examples of those growing on a medium. Proteus vulgaris, serratia marcescens are examples of those growing on mediums and sodium lauryl sulfate mediums. Those not growing on any shampoo medium included alcaligenes faecalis and achromobacter thalassius, as a few for example. At least two anionic surface-active agents were sound to allow some growth from a few bacteria types.

REFERENCE: Journal Bacterial, Vol. 58, No. 6, 1949, pp. 823-824.

230. BACTERIAL UTILIZATION OF DODECYL SULFATE AND DODECYL BENZENE SULFONATE

by

W. J. Payne and V. E. Feisal

This experiment was conducted over two isolants taken from enriched soils and place on media for culturing. In testing the isolant, C12B was able to grow in the foaming area. The other bacterial isolant, C12, destroyed the foaming capacity because of the dodecyl sulfate in its system. Dodecyl benzene sulfonate did not kill the foaming process due to the kerosene isomers from which it came. Results from the test reveal phenyl isomers of dodecyl benzene sulfonate from 2, 3, or 6 alkyl chains were perfect for C12B growth. Phenyls of carbon 4 or 5 showed toxic effects toward the bacteria.

REFERENCE: Applied Microbiology, Vol. 11, February 18, 1963, pp. 339-344.

231. THE BEHAVIOUR OF HEXACHLOROBENZENE IN PINE FOREST MICROCOSMS: TRANSPORT AND EFFECTS ON SOIL PROCESSES

by

Beverly S. Ausmus et al.

An investigation was conducted to determine the transport of Hexachlorobenzene in a loblolly pine forest soil and its effect on nutrient cycling processes in the microcosm. Soil cores were obtained and tested for hexachlorobenzene transport by volatization and leaching, carbon dioxide efflux and calcium loss. The experiment revealed a measurable quantity of carbon-14 in particulate and dissolved form. Hydrochlorobenzene altered the soil nutrient cycling processes as indicated by an increasing loss of calcium. Hydrochlorobenzene also inhibited efflux of carbondioxide from soil biotic activity.

REFERENCE: Environmental Pollution, Vol. 20, October 1979, pp. 103-111.

232. BIODEGRADATION OF POLYNUCLEAR AROMATIC HYDROCARBON POLLUTANTS BY SOIL AND WATER MICROORGANISMS

by

Eva J. McKenna and R. D. Heath

This report examines the limits of polynuclear aromatic hydrocarbon degradation in soil and water by microorganisms, and the persistence of polynuclear aromatic hydrocarbons in the presence of degrading microorganisms.

REFERENCE: UILU-WRC-76--0113, April 1976, pp. 1-25.

233. BIOLOGICAL ASPECTS OF LAND REHABILITATION FOLLOWING HYDROCARBON CONTAMINATION

by

C. Gudin and W. J. Syratt

This paper studies the respiratory activity of four different soil types which had received hydrocarbon materials, either by an accident or deliberately, over a one to four year period were investigated. The disappearance of two solid hydrocarbon residues after incorporation into soil and the effect of incorporation of the residues on plant growth were also looked at in the study. An increase in microbial oxygen uptake is caused by the incorporation of hydrocarbon material into the soil. Also seen is competition between microorganisms and higher plants for available soil nitrogen. A study of 15 oil-contaminated sites showed that members of the Leguminosae are abundant in oil-contaminated areas, may be because of the nitrogen-fixing symbiotic relationship with Rhizobium spp. Rehabilitation of soil spill sites should include improved aeration of the soil, the addition of a nitrogenous fertilizer, and the creation of a vegetation cover to improve the rhizosphere.

REFERENCE: Environmental Pollution, Vol. 8, 1975, pp. 107-112.

For article on related subject see No. 140.

234. BIOLOGICAL PROPERTIES AND BEHAVIORS OF CYANOGENIC WASTES

by

Charles E. Renn

This report was concerned with the effect of cyanogenic wastes when introduced in various concentration into the environment. The comparison of several such wastes and the tolerance of fish to each was of special interest. Potassium cyanide at extremely low concentrations showed toxic effects on fish. Tolerance levels were only slightly higher for lactonitrile. Much higher levels of acrylonitrile nitrogen were tolerated than was tolerated as cyanide or lactonitrile. Toxicity was found to be influenced by water hardness or pH. The age of the solution where hydrolytic decomposition occurred was also of importance.

REFERENCE: Sewage and Industrial Wastes, Vol. 27, No. 3, March 1955, pp. 297-310.

235. BORON, STRONTIUM, AND BARIUM ACCUMULATION IN SELECTED PLANTS AND LOSS DURING LEAF LITTER DECOMPOSITION IN AREAS INFLUENCED BY COAL STRIP MINING

by

James D. Lawrey

Boron, strontium, and barium were found located in a surface coal mining area in eastern Ohio. It was determined especially for plant species usually found in strip-mined and unstripped habitats. Boron exhibited the highest values within the species of the strip-mine where strontium and barium were lower in value. In leaf litter decomposition of 10 selected trees, boron loss was greatest after one year, followed by strontium. Barium appeared to gain value during certain leaf break-down, whereas, it lost value in other leaves after one year. During leaching, boron was found to be affected mostly after the time period of one year and indicated boron loss during the interval of leaching. Strontium and barium showed during leaching little mobility. In drainage of the soil, strip-mining changes with concurrent increases in plant assemblage of boron. Boron loss from break-down in leaf litter shows little increase of boron in litter with time.

REFERENCE: Canadian Journal of Botony, Vol. 57, 1979, pp. 933-940.

For article on related subject see No. 142.

236. BOROSILICATE GLASS AS A CONTINUING SOURCE OF BORON FOR ALFALFA

by

E. R. Holden and A. J. Engel

Borosilicate glasses have been studied as a possible source of steadily released fertilization in areas with heavy rainfall. A coarsely ground borosilicate glass was added to a sandy loam where alfalfa was grown. Minus 20-mesh glass No. 176-C was added to soil in amounts equivalent to 0, 19, 38, 76 and 152 pounds of borax per acre. Ranger alfalfa was planted in May, harvested four times in the following seven months, dried, weighed and analyzed for boron. Application of the glass up to the 19-pound level caused an increase in yield. In applications above 19-pounds, the yield remained constant, but content and uptake of boron continued to increase. Similar testing on the second year indicated that a sufficient supply of water-soluble boron for the alfalfa could be obtained from the residual glass.

REFERENCE: Agricultural and Food Chemistry, Vol. 6, No. 4, April 1958, pp. 303-306.

237. BROMINE RETENTION IN SOME SOILS AND UPTAKE OF BROMINE BY PLANTS AFTER SOIL FUMIGATION

by

Zenobius Stelmach

Three bromine containing compounds were applied to various crops to determine bromine retention of soils, plant uptake of the substance and its affect on crop yield. Of the three soils used, two retained moderate amounts of bromine, while the third retained only small amounts. Bean and cabbage plants were found to contain the highest bromine concentrations of the plants sampled. Generally, plants grown in treated soils contained the highest levels of bromine in the root system and the lowest level in the stem. Crop yields varied widely; however, a decrease in production after the application of bromine was the most common. The adverse affects present were thought to have been caused by damping off and nitrogen deficiency.

REFERENCE: Soil Science, Vol. 88, August 1959, pp. 61-66.

238. CADMIUM ABSORPTION AND GROWTH OF VARIOUS PLANT SPECIES AS INFLUENCED BY SOLUTION CADMIUM CONCENTRATION

by

A. L. Page et al.

There is little information for cadmium in relation to the substrate cadmium. Cadmium was reported to be harmful to plants, animals, and human lives. It was suspected after treating radish tops gathered in close proximity of a frequently traveled road that the tree residue had a part in producing cadmium. Further investigation of phosphate fertilized plants showed certain amounts of cadmium in the soil. In comparing the cadmium content of foods in general, the plants grown in fields fertilized with phosphate had slightly more cadmium than the other controlled plants. This was not in excess when compared to general lines of foods. The plant leaves tested revealed cadmium concentrates increased as the substrate solution was added. The levels of concentration did differ showing cabbage being most absorbent with 50% growth reduction of a concentration of 9 μg/ml cadmium. Beets, turnips, and beans showed the least toleration with 0.2 μg/ml concentration. This data shows the cadmium concentration in the substrate effects the level of cadmium in foods.

Two techniques were used to show the amount of cadmium in plant materials. The two methods used were a dry and wet ashing-atomic absorption test. The amounts ranged from 8-10 μg/ml cadmium/g in the dry ashing-atomic method. It was found that in the dry ashing-atomic procedure the volume was slightly greater in value than in the wet ashing-atomic absorption. The reason for the differences is the amount of plant material ashed. For 10 μg/g or less, lg of material from the plant was ashed, and if the cadmium content was 25 μg/g or greater, only 0.5 g or less was ashed of the plant material.

In summarizing the data, the tolerance of the plants tested of cadmium covered a wide range. Growth reduction can exist and depends on the solution concentration and the μg/ml level the plant is submitted. According to the authors there is no real information available to decide whether cadmium levels will be a health hazzard or not toward plant, animal, or human life. This report does, however, suggest that soils affected by cadmium concentrations can accumulate cadmium in sufficient amounts to be a concern of the public for health related reasons.

REFERENCE: Journal of Environment Quality, Vol. 1, No. 3, 1972, pp. 288-291.

239. CALCIUM ARSENATE AND UNPRODUCTIVENESS IN CERTAIN SOILS

by

W. B. Albert and W. R. Paden

Calcium arsenate applications to sandy loam soils were studied as to their effect on plant growth. Increased calcium arsenate concentrations increased arsenic content of plant tissue and caused more severe growth defects. Organic matter content of the soil affected arsenic toxicity in that appreciable plant growth existed in forest land soil even after calcium arsenate applications. Calcium carbonate and various iron salts were shown to decrease arsenic concentrations by diffusate analysis. Calcium hydroxide neutralization of the soil also showed some significant benefits in arsenic reduction.

REFERENCE: Science, Vol. 73, No. 1901, 1931, p. 22.

240. CAN BORIC ACID IN HIGH DILUTION EXERT A STIMULANT ACTION ON PLANTS?

by

M. Nakamura

Because some soils have been found to contain borates and, therefore, have small quantities of boric acid present, this study was conducted to determine the effect of boric acid on plant growth. Extremely small concentrations of boric acid did cause some sort of growth stimulation, while larger applications all caused poisonous effects. Past studies have also documented the toxic nature of boric acid in plants and animals.

REFERENCE: Bull. Coll. Agric. Tokyo Inp. Univ., Vol. 5, No. 4, 1903, pp. 509-512.

241. CHEMICAL FACTORS CONTROLLING THE ADAPTATION OF WEEPING LOVEGRASS AND TALL FESCUE TO ACID MINE SPOILS

by

A. L. Fleming et al.

Grasses and legumes have been used in the revegetation of acid strip mine spoils. Weeping lovegrass and tall fescue were studied to determine their reaction to environments containing Aluminum and Manganese, which are present in strip mine spoils of the Appalachian Mountains. Phosphorus was added to increase plant growth.

Weeping lovegrass was found to be more productive than tall fescue in acid mine spoils, which have high Aluminum concentrations or low pH. Both weeping lovegrass and tall fescue were grown successfully on spoils with high Manganese concentrations.

REFERENCE: Agronomy Journal, Vol. 66, no. 6, November-December 1974, pp. 715-719.

242. THE CHEMISTRY AND PHYTOTOXICITY OF ARSENIC IN SOILS: II. EFFECTS OF TIME AND PHOSPHORUS

by

E. A. Woolson et al.

Through time arsenate changes to a reduced soluble compound from sodium arsenate. To determine the breakdown solubility, arsenic was analyzed in 1N NH_4Cl 0.5N NH_4F, 0.1N NaOH, and 0.5N H_2SO_4. Following the study, the arsenates were identified as water soluble arsenate. Aluminum, iron, and calcium were recognized as water soluble arsenics. Amongst the water soluble arsenics available, the level of arsenic applied was equally contributed with the aluminum and iron in the soil. The Hagerstown silty clay loam had predominantly more iron-arsenate compared to lake land loamy sand which had more of the aluminum arsenic. Testing the growth of corn on arsenic soil proved that the longer the incubation time was intensified, the growth in corn increased. With phosphorus added to the arsenic, phytotoxicity changed. With applications of phosphorus, the arsenic phytotoxicity was higher, and in the Hagerstown soil, it increased. Depending on the arsenic and phosphorus in the soil, the plant will respond accordingly. Application of arsenic was distributed differently when a leaching process decreased arsenic 77% in the Dunkirk fine sand.

REFERENCE: Soil Science Society of America Proceedings, Vol. 37, 1973, pp. 254-259.

243. THE CHEMISTRY OF HUMIC SUBSTANCES

by

W. Flaig

This paper discusses in detail the chemistry of humic substances. These substances are derived from lignins. Quinones are formed from the decomposition of lignin products, which in turn are changed to synthetic humic acids. Lignin substituents were carbon-14-labeled to identify the intermediate decomposition products. The structure of the substance is thoroughly discussed, while they were in the presence of substances such as 1,2-diphenyls and phenoloxidases.

REFERENCE: Supplement to Journal of Applied Radiation and Isotopes, 1963, pp. 103-127.

244. CHLORINATED HYDROCARBON PESTICIDES: DEGRADATION BY MICROBES

by

C. I. Chacko et al.

An investigation was conducted to locate soil microbes that can break down DDT, dieldrin and pentachloronitro-benzene (PCNB). The degrading ability of several species of fungi and actinomycetes was tested by growing the test microorganism in a nutrient medium which contained a specific amount of the chosen pesticide. After 6 days, the amound of pesticide remaining in the solution was determined by gas chromotography.

All test organisms, but one, degraded PCNB to a metabolic product. None of the microorganisms successfully reduced dieldrin. While all types of fungi had no effect on DDT, 6 of 9 types of actinomycetes declorinated DDT to DDD.

REFERENCE: Science, Vol. 54, November 18, 1966, pp. 893-894.

245. CHLORINE--A MICRONUTRIENT ELEMENT FOR HIGHER PLANTS

by

T. C. Broyer et al.

Tomato plants grown in cultures where the chlorine content was strictly controlled were used to determine the necessity of chlorine for the growth of higher plants. When chlorine levels were sufficiently low, plants developed such deficiency symptoms as wilting, chlorosis, neurosis, and discoloration. Determinations were made as to the plant yield at different concentrations as well as location of chlorine within the plant. The article concludes chlorine to be an essential micronutrient element for maximum growth.

REFERENCE: Plant Physiology, Vol. 29, 1954, pp. 526-532.

246. CLEAVAGE OF THE ETHER BOND OF PHENYLMETHYL ETHERS BY ENZYMES OF ARTHROBACTER SP.

by

Deborah D. Raymond and M. Alexander

This study revealed that enzymes of the bacterium arthrobacter sp. could convert m-methoxybenzoate to m-hydroxybenzoate and vanillate to protocatechuate. The enzymes also formed formaldehyde from the ether bond cleavage of m-methoxybenzoate, vanillate and other methoxy compounds. In addition, it was shown that the enzymatic cleavage of the ether bond of m-methoxybenzoate required gaseous oxygen (O_2) and a reduced pyridine nucleotide.

REFERENCE: Pesticide Biochemistry and Physiology, Vol. 2, 1972, pp. 270-277.

247. COBALT: A MICRONUTRIENT ELEMENT FOR THE GROWTH OF SOYBEAN PLANTS UNDER SYMBIOTIC CONDITIONS

by

Shaukat Ahmed and Harold J. Evans

This study determined the effects of small concentrations of cobalt on the growth of soybean plants under symbiotic conditions. The plants were grown in nitrogen deficient soils where they were forced to depend upon symbiotic nitrogen fixation. Results showed that plants given nutrients without the presence of cobalt were stunted in growth with some plants eventually dying. Plants given solution containing nitrogen continued growing vigorously. The study concluded that trace amounts of cobalt are essential for the growth of soybean plants in nitrogen deficient soils under these conditions.

REFERENCE: Soil Science, Vol. 90, 1960, pp. 205-210.

248. COBALT AND NICKEL IN SOILS AND PLANTS

by

R. L. Mitchell

Because of the close geochemical relation between cobalt and nickel, their behavior in soil and plants was studied together. There was no correlation found between soil content of cobalt and nickel and plant uptake mainly because the substances are bound in a crystal lattice and are not readily available to plants. However, when uptake of these elements does occur, plants tend to prefer nickel over cobalt. Small additions of nickel to the soil was beneficial to plants, while addition of cobalt resulted in depressed yields. Cereals grown in soils with high nickel content were also found to have higher nickel content in the grain produced. In areas of low cobalt levels, livestock were found to acquire cobalt deficiencies, while the primary problem with nickel is its poisonous effects on plants given higher concentrations.

REFERENCE: Soil Science, Vol. 60, 1945, pp. 63-70.

249. COBALT IN NITROGEN FIXATION BY A LEGUME

by

H. M. Reisenauer

Today's understanding of cobalt as a micro-nutrient element, which is required by most animal species and various micro-organisms, evolves around the role of vitamin B_{12}. In most animal species, vitamin B_{12} is required for the formation of hemoglobin and may be involved with protein metabolism. In one experiment, the results showed the huge reductions in the amount of nitrogen fixed by inoculated lucerne plants effect when culture solutions are purified and controlled with regard to cobalt contamination. In an experiment directed by Hohn-Hanson, they noted that in the cultures with low content, growth reduction of the nitrogen fixing species was more pronounced than for the species requiring combined nitrogen. The amount of the results obtained here clearly implies an essential role of cobalt in symbiotic nitrogen fixation.

REFERENCE: Nature, Vol. 186, April 30, 1960, pp. 375-376.

For article on related subject see No. 145.

250. COMETABOLISM OF THE HERBICIDE 2,3,6-TRICHLOROBENZOATE

by

Raymond S. Horvath

This article describes the degradation of 2,3,6-trichlorobenzoate by Brevibacterium sp and the oxidative pathway through which the degradation proceeded. The pathway went from 2,3,6-trichloro-4-hydroxybenzoate, then to 2,3,5-trichlorophenol with the end product result being 3,5-dichlorocatechol.

REFERENCE: Journal Agricultural Food Chemistry, Vol. 19, No. 2, 1971, pp. 291-293.

251. COMPARATIVE FLUORINE UPTAKE BY PLANTS IN LIMED AND UNLIMED SOIL

by

Annie M. Hurd-Karrer

Fluorine applied to soil as hydrofluoric acid to 50 ppm, in small increments, was administered over a period of 6 weeks. The limed and unlimed soil differentiated the plant fluorine uptake (collard plant). Lime in the soil decreased fluorine uptake in the plants, and there was a decrease in withering and chlorosis. Whereas, unlimed soil had a larger amount of fluorine uptake, and the plants were not as capable of tolerating the concentration of fluorine. When collard and buck wheat were compared, the buck wheat showed a larger amount of toleration toward sodium fluoride, calcium fluoride, and other fluoride factors.

REFERENCE: Soil Science, Vol. 70, 1950, pp. 153-159.

For article on related subject see No. 53.

252. A COMPARISON OF METHODS FOR HYDROCARBON ANALYSIS OF MARINE BIOTA

by

R. L. Gritz and D. G. Shaw

This study compared methods of analyzing biological materials for hydrocarbons. The methods, Soxhlet extraction with two hour saponification and direct two hour saponification, did not adequately remove esters, and in some cases, caused emulsion problems. Twenty-four hour saponification and column chromatography was the most desirable method test. Separation of alkanes from aromatics was normally adequate, but in substances containing significant numbers of alkenes, analysis must be conducted with extreme care or by using more complex methods.

REFERENCE: Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 4, 1977, pp. 408-415.

253. A COMPARISON OF SEVERAL LEGUMES WITH RESPECT TO NITROGEN ACCRETION

by

T. L. Lyon and J. A. Bizzell

An experiment was conducted in which several legumes--hay crops, grain crops, and auxiliary crops--were planted and tested to determine which crops or combinations of crops were the best nitrogen fixers. Over the 10 year duration of the experiment, the nitrogen in the crop and in the soil were measured, and the total and average annual accretion of nitrogen was calculated. Alfalfa alternated with cereal crops had the highest nitrogen content of any combination, but alfalfa grown continuously was even greater in nitrogen content. The cereal combination was more effective, however, in causing a gain of soil nitrogen. Sweet clover and a mixture of red and alsike clover followed alfalfa in efficiency of nitrogen fixation. Specifics of the data accumulated are presented in tables included in the article.

REFERENCE: Journal of the American Society of Agronomy, Vol. 26, 1934, pp. 651-656.

254. CONSIDERATION OF SOILS FOR ACCEPTING PLANT NUTRIENTS AND POTENTIALLY TOXIC NONESSENTIAL ELEMENTS

by

L. M. Walsh et al.

It is not necessarily true that phytotoxic or accumulative elements will develop in the food chain when soils receive substantial amounts of nutrients and nonessential toxic elements; however, proper soil management practices and proper nutrient application rates need to be maintained to uphold proper water quality. A sound description of loading limits need to be defined for elements potentially hazardous to the environment.

Some subjects that are considered within this article concern plant growth and potential nutrient removal; the principle guiding crop and soil selection with emphasis on crop charaterisitics, soil conditions and loading limits; essential plant nutrients such as nitrogen, ammonia, excrement of man and animals, fertilizers, phosphorus, precipitation, bases and salts, sulfur, copper, zinc, boron, molybdenum, iron and manganese; potentially toxic nonessential elements such as aluminum, arsenic, cadmium, chromium, lead, mercury, selenium, and uranium; and loading limits for potentially toxic elements.

REFERENCE: Land Application of Waste Materials, Soil Conservation of America, 1976, pp. 22-47.

255. CONTAMINATION OF SOILS BY PETROLEUM HYDROCARBONS

by

Roscoe Ellis, Jr. and Russell S. Adams, Jr.

Contamination of soils by petroleum hydrocarbons, most commonly crude oil and natural gas, greatly affect the properties of soils and the growth of vegetation. The increase in organic matter and nitrogen content of soils increases microbiological activity. In several contaminated soils, deflocculation and loss of structure may lead to erosion. As gas saturates the soil, the air is displaced and growth of vegetation is eliminated for some time. However, the increased nitrogen supply may result in increased growth of vegetation after the soil returns to a normal oxidation state.

REFERENCE: Advances in Agronomy, Vol. 13, 1961, pp. 197-216.

256. CONTROL IN RHIZOCTONIA SOLANI BY PENTACHLORONITROBENZENE ACCUMULATED FROM SOIL BY BEAN PLANTS

by

P. R. Bristow et al.

Comparisons were made between plants which were grown in pentachloronitrobenzene treated soil and control plants as to their resistance to Rhizoctonia solani. PCNB was accumulated in the outer layers of the plant and, in general, promoted disease caused by the pathogen to be less severe. The effectiveness of the fungicide was decreased by the presence of higher quantities of organic matter. While PCNB decreased this specific microorganism type, the growth of other species may be increased.

REFERENCE: Phytopathology, Vol. 63, July 1973, pp. 808-813.

257. COPPER: AN ANALYSIS OF SOIL-PLANT RELATIONS

by

James Dragun and Dale E. Baker

This paper looks at the chemistry of copper in relation to soil and plant properties. Copper is held very strongly by several soil components; therefore, a small amount of movement of copper in the soils is shown and only very small amounts of copper can be found in soil water. Other amounts of copper can be added to soils from different sources. Copper sulfate has been used as fungicide for fruit crops and potatoes since the late 19th century. Also, the land recycling of sewage sludges has become more extensively used. One of the most important factors within a climatic region is soil copper, which affects the copper content of plants. Copper toxicity in plants can be produced by somewhat high levels and high availability of soil copper. At the present time, a new soil testing is being developed at Penn State to monitor the effectiveness of heavy metal status of soil. The Fair Funds administered by the Pennsylvania Department of Agriculture contributed partial support for this project.

REFERENCE: Science in Agriculture, Vol. 23, 1976.

For article on related subject see No. 55.

258. COPPER IN ANIMAL LIVER INDICATOR OF TOXICITY

by

W. S. Corbett and R. M. Leach, Jr.

This investigation discussed the problems associated with unusually high or low levels of copper in animal livers. The potential application of copper containing wastes to livestock production areas may result in the excessive copper uptake by the animals. Of particular concern were sheep because of their extremely low tolerance of copper. The localization and metabolism of copper in the liver of sheep was compared to that of laboratory rats. This resulted in an assumption that sheep are not able to synthesize metal-binding proteins, which aid in metabolism and excretion of copper. Possible solutions to this problem were genetic selection and consumption of high levels of dietary zinc, which promotes the synthesis of metal-binding proteins.

REFERENCE: Science in Agriculture, Vol. 23, 1976.

259. CROP PRODUCTION AND ANIMAL HEALTH PROBLEMS ASSOCIATED WITH HIGH SOIL MOLYBDENUM
CHAPTER 11

by

Sharon B. Hornick and Dale E. Baker

Molybdenum contamination in soils were studied for the toxicity association with molybdenosis found in cattle, vegetables, and forage crops. Soil molybdenum was located as far as 1.4 mi to 2. mi in ranges of 31 to 71 ppm from a molybdenum processing plant. There was a decrease of 5.1 ppm in the distance of 5 mi. Herbage 1.5 mi from the plant at 25.9 ppm molybdenum caused molybdenosis in cattle that was amended through copper glycinate vaccination and feeding of copper sulfate supplements. Major yield limiting factors were low amounts of phosphorus, poor soil cultivation, low pH and high aluminum availability. Experiments were conducted over two contaminated soils which differed in ppm of molybdenum with respect to calcium, phosphorus magnesium, and others. Crops were then grown on these soils, and no molybdenum toxicity was revealed. The chemical previously tried on the soils were observed later in the crops at varying ppm levels, but caused no harm.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 665-684.

For article on related subject see Nos. 149 and 150.

260. CRUDE OIL UTILIZATION BY FUNGI

by

J. S. Davies and D. W. S. Westlake

Soil from Northern Canadian oil-producing areas provided some sixty fungal isolates of which 34 were gathered through static enrichment techniques. Twenty-six of the fungi were from culture collections. These fungi were screened and tested for their growth ability on seven crude oils of various mixtures and also on n-tetradecane, naphthalene, and toluene. Forty some cultures were discovered to grow on one or more crude oils in which at least 28 soil isolates were also found on the crude oils. The data presented here shows growth ability on pure n-alkane is not a good indicator of ability to grow on crude oil. Gravimetric and gas-chromatographic techniques demonstrated the deterioration of crude oil on Rainbow Lake by isolates.

REFERENCE: Canadian Journal of Microbiology, Vol. 25, 1979, pp. 146-156.

For article on related subject see No. 151.

261. CUMULATIVE TOXIC EFFECTS OF BORON, LITHIUM, AND SODIUM IN WATER USED FOR HYDROPONIC PRODUCTION OF TOMATOES

by

E. F. Wallihan et al.

Boron, lithium, and sodium were tested individually and combined to compare the effect these chemicals would have on tropical tomato plants in solution cultures. The leaves showed evidence of chlorosis and necrosis after boron, lithium, and sodium were applied at levels of 2,2, and 140 ppm. The highest level of concentration in a leaf was evident at 170 ppm B, 80 ppm Li, and 7000 ppm Na. Among the lower concentrations, the elements were not seemingly effected.

REFERENCE: Journal of American Society of Horticulture Science, Vol. 103, 1978, pp. 14-16.

262. CYTOLOGICAL DETECTION OF MUTAGEN--CARCINOGEN EXPOSURE BY SISTER CHROMATID EXCHANGE

by

P. Perry and H. J. Evans

The symmetrical exchange of sister chromatids at one locus is now being used for detection of mutagens-carcinogens. The frequency of sister chromatid exchange, measured by autoradiographic studies, was known to increase after exposure to X-rays, ultraviolet light, and chemical mutagens. But with the advent of straining techniques ultilizing 5-bromo-deoxyuridine, sensitive and isotopes and autoradiography. The method reported on in this article used cultured Chinese hamster cells. At the time of this article, there is question whether sister chromatid exchange is a constant indicator of or perhaps results directly in aberrations in some instances.

REFERENCE: Nature, Vol. 258, 1975, pp. 121-125.

263. DECOMPOSITION OF SPECIFICALLY CARBON-14-LABELED FERULIC ACID: FREE AND LINKED INTO MODEL HUMIC ACID-TYPE POLYMERS

by

J. P. Martin and K. Haider

This study compared the decomposition of several types of ferulic acids while in free state and while linked into model phenolic polymers. Carbon loss was significant in most cases involving free ferulic acids. The linkage of the acids to model humic acid-type polymers significantly decreased microbial decomposition of the ferulic acid. Side group carbons seemed to be most strongly affected by microbial degradation. The degree of aeration in the environment affected metabolism of phenolic compounds to some extent.

REFERENCE: Soil Science Society America Journal, Vol. 40, 1976, pp. 377-380.

264. DEGRADATION OF A NONIONIC SURFACTANT IN SOILS AND PEAT

by

N. Valoras et al.

This paper presented a study that determined the effects of soil moisture content and rate of application on the degradation of Soil Penetrant 3685, a nonionic surfactant in soil and peat. Water-repellant soils, one wettable soil, and Canadian Sphagnum peat were used. Time produced "S" type curves versus plots of degradation percentage. The lag period increased previous to most rapid degradation by increasing the concentration. The highest percentage of surfactant degradation occurred in sandy loam, and the lowest in the peat with Glendora being the middle. The percentage of decomposition is related to the amount of surfactant absorbed by the different soils. From 73 to 83% of the added surfactant C was released from the mineral soils during the incubation period. By decreasing the soil moisture content, the rate of degradation also declined. Of surfactant applications up to 10,000 ppm, the soil organic matter was not affected, however, it gradually decreased with higher surfactant concentrations.

REFERENCE: Soil Science Society of America Journal, Vol. 40, 1976, pp. 60-63.

265. DEGRADATION OF CRUDE OIL BY YEASTS AND ITS EFFECTS ON LESBISTERS RETICULATUS

by

W. L. Cook et al.

Hydrocarbonoclastic yeasts of high densities were isolated from fresh and marine waters being enriched with oil. Strains had various characteristics from affects of chronic oil pollution; for example, some demonstrated high rates of oil oxidation and emulsification. Also the ability to utilize various hydrocarbons was affected by the pollution. Yeasts possibly can be utilized from the oil pollution to facilitate degradation as seen from the observations. If for testing purpose an inocula "seed" of high concentrations is spread, careful attention should be given to the potential pathogenicity and toxicity of their metabolites for natural biota. Two such hydrocarbonoclastic yeasts were selected for activities concerning the aforementioned hydrocarbon-utilization. Candida tropicalis and Endomycopsis lipolytica were examined in correlation with the crude oils and their effects on common guppies mortality, Lesbistes Reticulatus.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 279-282.

266. DEGRADATION OF DIELDRIN TO CARBON DIOXIDE BY A SOIL FUNGUS TRICHODERMA KONINGI

by

M. W. Bixby et al.

Dieldrin is a chlorinated hydrocarbon insecticide that is very persistent in the environment. It is known that some microorganisms can degrade this toxic hydrocarbon to safe metabolites. This particular fungi was selected to test because of good growth with dieldrin as the only source of carbon. It was shown that this fungi was capable of degrading carbons from the chlorinate ring of dieldrin molecules and no other degradation products besides ^{14}C-carbon dioxide were identified.

REFERENCE: Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, 1971, pp. 491-494.

267. DEGRADATION OF ENDRIN, ALDRIN, AND DDT BY SOIL MICROORGANISMS

by

K. C. Patil et al.

This research concentrated on the ability of various soil microorganisms to degrade five insecticides: endrin, aldrin, DDT, baygon and a gamma isomer of benzenehexachloride (y-BHC). Twenty cultures of various microorganisms were used. The majority of these were found to degrade endrin, aldrin, and DDT, while none of the cultures degraded baygon or (y-BHC). It was concluded that the enzymes which occur naturally in the soil and degrade all five insecticides must vary considerably in characteristics.

REFERENCE: Applied Microbiology, Vol. 19, May 1970, pp. 879-881.

268. THE DEGRADATION OF POLYCHLORINATED BIPHENYLS BY MICRO-ORGANISMS

by

R. A. Baxter et al.

The effects were studied on two micro-organism cultures from single compounds and mixtures of multicomponent polychlorinated biphenyls (PCBs). These PCB compounds of up to six chlorine atoms per molecule could be broken down. PCB compounds were frequently found to be more degraded in present single compounds rather than multi-component mixtures. Work on single compounds does not enable further predictions about commercial mixtures to be made. Tentative explanations are available for the actions of mixture exposed to the cultures in this report.

REFERENCE: The Science of the Total Environment, Vol. 4, 1975, pp. 53-61.

269. DESTRUCTION OF BENZO(A) PYRENE BY SOIL BACTERIA

by

M. N. Poglazova et al.

Man's environment as a result of incomplete combustion of coals and oil products has a wide spread hydrocarbon known as benzo(A) pyrene (BP). Benzo pyrene has been known to be found in large amounts around large cities and around areas such as railways or old oil refineries. Samples have contained up to 200 mg F benzo pyrene per 1 kg of soil. Recent studies show some microorganisms are capable of accumulating benzo pyrene. It can also be transformed through the process of metabolism.

Methods are used in offering new data about the presence of bacteria able to accumulate and destroy benzo pyrene. Seventeen strains of pore forming aerobic bacteria were isolated from soil samples of an oil refinery; samples contained 100 mg of benzo pyrene per 1 kg of soil. Bacteria were isolated and cultivated on meat infusion agar. This bacteria was tested through different series. Samples had 100 mg of benzo pyrene per 1 kg of soil. The soil was kept in a thermostat for 8 days at 28°C. In a photoelectric method, data was recorded by a DFS-12 spectrometer, which carries out at 10^{-7} - 10^{-8} g/ml. Several more isolated strains with soil bacteria were tested and they proved the hydrocarbon disappeared in four days at the rate of 16 percent. Benzo pyrene extracted was tested to show biomass of bacteria after extractions of n-octane had been hydrolysed. Nutrient medium and KOH mixed with ethanol for 3 hours at 80°C was tested for further extractions. These show the disappearance of benzo pyrene from nutrient medium and microbial biomass has no connections with benzo pyrene-nutrient complexes. Benzo pyrene contaminated soil show bacteria can accumulate benzo pyrene and also transform large amounts of it by oxidation. Soil bacteria cultivated too long gradually loses the ability of destroying benzo pyrene. For example, soon after isolation, 72% of the benzo pyrene contaminants were destroyed. Four months after laboratory cultivation, only 26% of the substance was destroyed. Preliminary flouresence microscopic exams show bacteria actively accumulates benzo pyrene, fatty inclusions and lipoprotein components of cytoplasm.

Thus experiments show benzo pyrene, the carcinogenic hydrocarbon, can be destroyed by some bacteria cultivated in laboratories and in the soil which is contaminated. This presents, biologically, a way of ridding soil of carcinogenic hydrocarbons. Possibly by increasing cultivation of some soil bacteria, benzo pyrene contaminants can be destroyed. This increased activity results in appropriate enzymastic systems used by aromatic hydrocarbon.

REFERENCE: Life Sciences, Vol. 6, 1967, pp. 1053-1062.

For article on related subject see No. 153.

270. DEVELOPMENT AND APPLICATIONS OF BACILLUS SUBTILIS TEST SYSTEMS FOR MUTAGENS, INVOLVING DNA-REPAIR DEFICIENCY AND SUPPRESSIBLE AUXOTROPHIC MUTATIONS

by

Hiroshi Tanooka

For testing purposes, a mutagen-tester of Bacillus subtilis was constructed and known carcinogens were tested. A parental strain was transformed to carry excision-repair deficiency mutation of the 'his' and 'met' genes. In a construction of TK15211 A 20-30 fold sensitivity showed a higher level of His reversion than the parental strain. These results followed application of UV and UV-mimetic treated chemicals. Methyl methanesulfonate along with X-rays showed no reaction of change on the mutagens. Spot testing was conducted with 30 various chemicals with the tester strain. The results were equivalent, but at times were broader in detection when compared with other systems. Other tests were conducted to detect repair-dependent DNA damage that is produced by chemicals. It was found that spores could be used in the different testings.

REFERENCE: Mutation Research, Vol. 42, 1977, pp. 19-32.

271. DEVELOPMENT OF MUTAGENICITY TESTS USING ESCHERICHIA COLI K-12 INDICATOR ORGANISM

by

Georges Mohn et al.

This report reveals Escherichia Coli K-12 (strain 343/113) to be as useful as other bacterial strains for testing the mutagenicity of environmental compounds. Escherichia was placed in various genes and picked separate parts of bacterial populations. Bacterial types detected were auxotrophies, 5-methyl-tryptophan and phenotype. In order to discover mutants, it is reasoned from the study that DNA deletions and changes are helpful in the process. Different tests were used in the study including spot, liquid, extract of mammalian organs and mammalian-mediated.

REFERENCE: Mutation Research, Vol. 25, 1974, pp. 187-196.

272. EARLY EFFECTS OF PHYTOTOXIC BURDENS OF CADMIUM, COBALT, NICKEL, AND ZINC IN WHITE BEANS

by

Wilfried E. Rauser

White bean seedlings were exposed to the heavy metals cadmium, cobalt, nickel, and zinc. The seedlings response after one day were observed and compared to determine if these metals produced similar changes in the plant, thus denoting similar photoxicity through similar mechanisms.

REFERENCE: Canadian Journal of Botony, Vol. 56, 1978, pp. 1744-1749.

For articles on related subject see Nos. 12 and 143.

273. THE ECOLOGICAL SIGNIFICANCE OF ANTIBIOTIC PRODUCTION

by

P. W. Brian

The production of antibiotics by several types of organisms and its significance to the ecology of the surrounding environment was studied. The majority of the study dealt with antibiotic production in the soil; however, a brief study of such organisms in water and plant tissue is also included. Experiments were conducted in supplemented sterile soil, unsupplemented sterile soil, and in soil containing normal microflora. A positive relationship was found between the presence of antibiotic-producing organisms and biological activity in the environment.

REFERENCE: Microbial Ecology 17th Symposium of Society of Gen. Microbiology, 1958, pp. 168-188.

274. EFFECT OF AMENDMENTS ON THE MICROBIAL UTILIZATION OF OIL APPLIED TO SOIL

by

A. Jobson et al.

Tests were completed over replicate plots under controlled analysis. For a period of 10 months, the experiments were run by applying oil, bacteria and fertilizers upon the plotted fields. A method such as chromatographic technique was used to record any changes that took place in chemical make-up. Fertilizer appeared to stimulate bacterial growth and use the n-alkane components the most. Oil helped the rate of n-alkane grow slightly at a range between C20 to C25. Fertilizer did show the greatest amount of increase in recovery when compared to the other applicants.

REFERENCE: Applied Microbiology, Vol. 27, January 1974, pp. 166-171.

For article on related subject see No. 157.

275. EFFECT OF APPLIED SELENATE ON RYEGRASS AND ON LARVAE OF SOLDIER FLY, *INOPUS REBRICEPS* MACQUART

by

J. H. Watkinson and G. M. Dixon

At 11 rates, selenate was applied from 1 to 10^5 selenium/ha toward ryegrass and soldier fly larvae surface soil. Growth in ryegrass plants diminished after 11 weeks of application when the level of selenate reached 2500 µg/g. Solider fly larvae mortality was raised above the point of poisoning or starvation with the addition of selenium. The maximum of selenium was at an intermediate level between the root and shoot of the larvae. The concentration was at a level of 200 µg/g.

REFERENCE: New Zealand Journal of Experimental Agriculture, Vol. 7, 1979, pp. 321-325.

For article on related subject see No. 159.

276. EFFECT OF BROMIDE FROM A SOIL FUMIGANT AND FROM $CaBr_2$ ON GROWTH AND CHEMICAL COMPOSITION OF CITRUS PLANTS

by

J. P. Martin et al.

The purpose of this study is to determine the effects of bromine from calcium bromide treatments of the effects of ethylene dibromide fumigation prior to planting on the growth and chemical composition of citrus plants. The percentages of calcium, magnesium, phosphate, sodium or phosphorus were not affected by the treatment. Fumigation prior to planting with ethylene dibromide or treatment with calcium bromide reduced growth of citrus seedlings; however, fumigation with ethylene dichloride or treatment with calcium chloride had little or no effect. In one soil, higher concentrations of bromine found in citrus leaves correlated with reductions in growth rates. Citrus leaf bromine concentrations stemming from either application of calcium bromide on soils or soil pretreatment with ethylene dibromide fumigant were linked to comparable growth retardation.

Carrot and lima bean plants showed more tolerance to bromine than citrus plants. A percentage comparison is drawn between citrus plants and carrot and lima bean plants.

REFERENCE: Soil Science Society Proceedings, 1956, pp. 209-212.

277. EFFECT OF CHEMICAL STRUCTURE ON MICROBIAL DECOMPOSITION OF AROMATIC HERBICIDES

by

M. Alexander and M. I. H. Aleem

This study is dealing with the application of herbicides on plant life. Not only does it have a persistant affect; it has a decomposing affect as well. The phytotoxicity of these herbicides can be found within the soils many years after application. Therefore, it is known that the herbicide has a lasting affect. One small exception is found in a group of compounds, but there is little evidence of favorable conditions. Most active substances will be found in soil microflora. Further tests with certain soil groups and the use of halogenated phenols and phenoxyalkyl acids will be selected and analyzed.

REFERENCE: Agricultural and Food Chemistry, Vol. 9, No. 1, January/February 1961.

For articles on related subject see Nos. 161 and 162.

278. EFFECT OF FLUORINE CONTENT OF IRRIGATION WATER ON THE GROWTH OF FOUR PLANT SPECIES IN RELATION TO SOIL SALINITY

by

M. Maftoun and B. Sheibany

Maize, sunflower, soya bean, and mung bean plants were used to determine the effect of different concentrations of fluorine in relation to various soil salinity levels. Dry weights of both tops and roots of the plants were tested. The adverse effects on all four types were more pronounced as the fluorine concentration increased. When equal amounts of fluorine were present at different salinity levels, plant growth was suppressed more severely in saline soils than in non-saline soils. The fact that soil salinity levels work additively with fluorine levels in inhibiting crop yields is especially important in that fluorine content is generally assocaited with irrigation water.

Roots and/or tops of all plants were eventually affected by fluorine concentrations. Of these, maize was found to be the most resistant to fluorine concentrations, and sunflower plants were the most sensitive.

REFERENCE: Trop. Agric. (Trinidad), Vol. 58, July 1979, pp. 213-218.

For article on related subject see No. 63.

279. THE EFFECT OF "MINOR" ELEMENTS ON THE GROWTH OF WHEAT IN OTHER PARTS OF THE STATE

by

L. J. H. Teakle and I. Thomas

From the tests run toward improving wheat growth, two important factors were found. One is the type of soil used and the conditions the wheat is grown under. Minor elements did not seem to improve yield as much as stable manure. In certain tests, there was a significant decrease in yield resulting from application of zinc sulphate and various elements when mixed together. Only under certain conditions and the right types of soil was any productive yield visible from application of various minor elements.

REFERENCE: Journal of Agriculture, W. Australia, Vol. 16, June 1939, pp. 143-147.

280. THE EFFECT OF RUBIDIUM SULPHATE AND PALLADIUM CHLORIDE ON THE GROWTH OF PLANTS

by

Winifred E. Brenchley

Various concentrations of rubidium sulfate and palladium chloride were applied to plant seed and seedlings during growth. Rubidium sulfate in no case altered plant or seed growth from that of control plants. Palladium chloride on the other hand displayed toxic effects at relatively low concentrations. The toxicity increased with increasing concentrations of the compound. Symptoms of palladium chloride toxicity were usually seen as stunting of the main and lateral roots. Toxicity effects also varied among the different plants used including barley, oats, peas, and broad beans.

REFERENCE: Annals of Applied Biology, Vol. 21, 1934, pp. 398-417.

281. EFFECT OF SOIL ACIDIFICATION ON VEGETATIVE GROWTH AND LEAF COMPOSITION OF LEMON TREES IN POT CULTURES

by

D. G. Aldrich et al.

This investigation determined the effect of soil acidification on yield and composition of lemon trees grown on alkaline soils. Results showed a positive correlation between soil pH and plant growth where growth decreased as the soils became more acidic with treatment. Salinity was also found to contribute to reduced plant yield. Detailed analysis of leaves indicated sulfur toxicity was a primary factor in growth reduction. While the effects of acidification vary widely with different soils and plants, it does not appear to be of any beneficial use for the management of citrus trees on neutral and alkaline soils.

REFERENCE: Soil Science, Vol. 79, 1955, pp. 427-439.

282. THE EFFECT OF SOIL-ADDED CADMIUM ON SEVERAL PLANT SPECIES

by

L. J. Miles and G. R. Parker

Plant species orignially from the northwestern part of Indiana were taken as seedlings and grown in a greenhouse for a time period of 6 weeks. Four-levels of soil-added-cadmium were tested in uncontaminated sandy soils. Cadmium/grams applied to the soils ranged from 0-100 μg in strenth. These cadmium levels were located in and around the industrial part of the urban area. From the data gathered, height was the only inaccurate indicator of cadmium concentration levels. Germination, weight, and constancy were fairly good indicators of cadmium present. Although the cadmium concentration was tested on various plants, this information came from concentration levels that were low in cadmium levels. Lastly, more data research will be done, but a test on cadmium tolerance on plants will be conducted because there is a good indication there exists some tolerance.

REFERENCE: Journal of Environment Quality, Vol. 8, No. 2, 1979, pp. 229-232.

283. EFFECT OF SOIL PHENOLICS ON THE GROWTH OF RHIZOBIUM

by

D. Purushothaman and K. Balaraman

This paper reports on the effect of certain soil phenolics on the growth of Rhizobium sp. The results show that of the four soil types examined, lignite contained maxium quantity of total phenols, besides the five phenolic acids. There were only two compounds present in black soil, and three of each in red and peat soil. The results from this study show that as lignite contains more quantities of phenolic than other soils do, it may prove toxic or inhibitory to the growth of Rhizobia if used as a vehicle. However, peat soil has only a very low quantity of phenolics, and this speaks of its suitability.

REFERENCE: Current Science, Vol. 42, No. 14, July 20, 1973, pp. 507-508.

For articles on related subject see Nos. 64 and 163.

284. THE EFFECT OF SOME MANGANESE SALTS ON AMMONIFICATION AND NITRIFICATION

by

P. E. Brown and G. A. Minges

This study determined the effect of the magnesium salts of chlorine, sulfur, nitrogen, and oxygen on nitrification and ammonification in soil. In all cases, small magnesium salt applications increased to some degree ammonification and nitrification, which may in turn increase crop yields. Large applications of the salts either inhibited or stopped ammonification and nitrification possibly due to the reduction of bacterial activity. The applications of magnesium, although following the same patterns, did vary to some degree.

REFERENCE: Soil Science, Vol. 2, No. 1, 1916, pp. 67-85.

285. THE EFFECT OF SURFACTANTS ON GROWTH OF FUNGI

by

G. W. Steiner and R. D. Watson

Cationic surfactants had the highest level of inhibition and a lower level of toxicity when compared to nine other surfactants. The test was chosen to discover what effects these surfactants would have on fungi. The fungus showed different reactions to different surfactants. One nonionic, TMN, showed a comparison to an anionic surfactant. Through testing, three surfactants showed similar reactions no matter the procedure used. The inhibition was the same degree in all the fungus colonies whether it was 100 ppm or 60,000 ppm. Nonionic surfactants showed inhibition of fungi at a level of 100 ppm.

REFERENCE: Phytopathology, Vol. 55, 1965, pp. 1009-1012.

286. EFFECT OF THALLIUM ON GROWTH OF TOBACCO PLANTS

by

J. E. McMurtrey, Jr.

This paper is over the effect of thallium poisoning on the growth of tobacco. In the last few years, an extensive search has been conducted to find the cause and the control of the so-called frenching disease of tobacco. The severity of the effects of thallium disagreed to some extent in the different soils and proved to be greater at the higher moisture contents. In conclusion, it cannot adequately prove that the frenching disease of tobacco is due to thallium toxicity at this present time.

REFERENCE: Science, Vol. 76, No. 1960, 1932, p. 86.

287. THE EFFECT OF TRACES OF BERYLLIUM ON THE GROWTH OF KALE, GRASS, AND MUSTARD

by

R. J. B. Williams and H. H. Le Riche

Beryllium in a growth medium at 1 to 2 ppm is toxic to plants. In an acid soil, beryllium is always toxic to plants at 1-2 ppm, but not so in soils with free calcium carbonate. Beryllium salt can increase growth in soils with free calcium carbonate.

REFERENCE: Plant and Soil, Vol. 19, No. 2, 1968, pp. 312-326.

288. EFFECT OF VARIOUS SOIL TREATMENT FOR CORRECTING ARSENIC INJURY OF PEACH TREES

by

A. H. Thompson and L. P. Batjer

A study was conducted to discover soil treatments which reduce the arsenic poisoning of peach trees planted in soils previously planted in apple trees. After the soil was treated with ammonium phosphate, ammonium sulphate, iron sulphate, and normal superphosphate, the injury appeared to be corrected by zinc sulphate and iron sulphate. The emphasis of this investigation was placed on the use of combinations of nitrogen and zinc in treating arsenic injury of peach trees. The investigation was conducted in 6 orchards in the Wenatchee and Yakima districts over 4 years. The results of the study indicate that injury resulting from arsenic toxicity was reduced when ordinary nitrogen applications were doubled and was nearly completely corrected when zinc sulphate was combined with high nitrogen fertilization. The addition of sulphur to these treatments increased effectiveness on alkaline soils, but not acid soils. Ferrous sulphate was found to be less effective than zinc sulphate. One zinc sulphate application followed by continuous high nitrogen fertilization was generally sufficient in treating arsenic injury to peach trees.

REFERENCE: Soil Science, Vol. 65, 1950, pp. 281-290.

289. EFFECT ON SOIL AND PLANT MINERAL LEVELS FOLLOWING APPLICATION OF MANURES OF DIFFERENT COPPER CONTENT

by

E. T. Kornegay et al.

Three different levels of copper, high level, low level, and no copper, were added to samples of finishing pig manure; and the manure was then added to a Groseclose soil supporting corn. This was then tested to determine the effects of manure containing high level copper on the soil and plants and to study ion movement in the soil. Each of the following, copper, potassium, zinc, phosphorus, calcium and magnesium levels increased. Of these elements, phosphorus was the only one found to permeate beyond the 10 cm depth before plowing. Although slight effects of potassium and phosphorus were found in the grain, copper levels remained constant with the grain normally fed to farm animals. This is significant in that the use of copper as a growth stimulate could be financially beneficial in agriculture.

REFERENCE: Plant and Soil, Vol. 45, 1976, pp. 151-162.

290. EFFECTS OF CADMIUM ON TWO BIOCONTROL INSECTS AND THEIR HOST WEEDS

by

P. C. Quimby et al.

The Alligatorweed Flea Beetle (agasicles hygrophilia) and Nutsedge Moth (Bactra verutana) are used for control of the Aquatic-Alligatorweed and the Purple Nutsedge Weed. The effects of cadmium on these plants is studied in relation to the feeding and reproduction of these biocontrol insects. Cadmium in Alligatorweed did cause marked decrease in the reproduction, life span, and feeding of the beetles. Cadmium in Purple Nutsedge did not produce any observed effects on any stage of moth development or reproduction or feeding of the Nutsedge moth.

REFERENCE: Bulletin of Environment Contamination and Toxicology, Vol. 22, 1979, pp. 371-378.

291. EFFECTS OF CAFFEINE ON THE FREQUENCIES AND LOCATION OF CHEMICALLY INDUCED CHROMATID ABERRATIONS IN BARLEY

by

H. Nicoloff et al.

Caffeine has an effect on the frequency and location of aberrations in barley caused by N-Methol-N^1-Nitro-N-Nitrosoguanidine and Maleic Hydrazine, M-N-NG and M-H respectively. The frequencies of aberrations induced by both chemicals was increased by post-treatment with caffeine; however, there was no delay in the appearance of aberrations from the M-N-NG affected barley. Caffeine did not exhibit its usual inhibition of post-replicant repair in the M-N-NG case. It was also found that certain chromosomal segments were more sensitive to caffeine augmentation of chemically induced aberration. Distribution of aberrations seem to be a function of differences in regional chromosomal repair capabilities.

REFERENCE: Mutation Research, Vol. 70, 1980, pp. 193-201.

292. EFFECTS OF CALCIUM ARSENATE ON RICE

by

A. H. Meyer

This paper reports on experiments that determine the tolerance of rice to calcium arsenate. Also, the yields from the use of fertilizers were obtained. From the experiments, it was found that no benefit is bad from the use of commercial fertilizers. It was also obtained that there was a slight decrease. The results from the experiments clearly show that under anaerobic conditions, calcium arsenate is very toxic to rice.

REFERENCE: Association of Southern Agricultural Workers, Proceedings of the 34th - 36th Annual Conference, 1933-1935, p. 241.

293. EFFECTS OF CHROMIUM ON GROWTH AND MINERAL NUTRITION OF SOYBEANS

by

M. A. Turner and R. H. Rust

The effects of chromium on growth and mineral uptake of soybeans, both in nutrient solution and in soil, was investigated. "Chippewa-64" and "Norsey" soybeans were germinated in moistened paper towels in a controlled environment, then treated with a potassium dichromate solution in varied concentrations. Soybeans were also planted in Nicollet loam in a similarly controlled environment and treated with a potassium dichromate solution.

Both varieties of soybeans behaved similarly. It appeared that chromium interfered with the ability of the soybeans to get calcium, potassium, magnesium, phosphorus, boron and copper from the soil, while iron and manganese were not affected. Potassium dichromate in the nutrient solution decreased amounts of calcium, potassium, phosphorus, iron, and manganese in tops, and magnesium, phosphorus, iron, and manganese in roots. Magnesium, zinc, and boron in the tops were unaffected by potassium dichromate.

REFERENCE: Soil Science Society of America Proceedings, Vol. 35, 1971, pp. 755-758.

294. EFFECTS OF ENVIRONMENTAL MOLYBDENUM LEVELS UPON WILDLIFE CHAPTER 15

by

Eldon W. Kienholz

Live traps were set up down stream of a molybdenum mining camp where Rainbow Trout were placed. Observers state there were alterations in the mineral content of the liver and kidney of the fish. Potassium was lowered to around 10% less than normal concentrations of potassium. During the two week peroid of testing, none of the fish died. In other experiments, baby chickens were fed with food containing 20% of the mine wastes. Here again, no handicap was visible in growth. Other tests report content of tissue molybdenum was normal, and there were no deleterious effects in such wildlife as the Pika.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 731-737.

295. EFFECTS OF LAND DISPOSAL APPLICATIONS OF MUNICIPAL WASTE ON CROP YIELD AND HEAVY METAL UPTAKE

by

P. M. Giordano and D. A. Mays

Field and greenhouse studies were carried out from 1969-1975 on the effects of municipal compost and sewage sludge applications to certain soils and plants. The study concluded that the sewage product matrix, for compost or sludge, is the primary determiner of plant uptake of heavy metals. Compost of municipal waste showed the least transfer of metals to plant tissue. Downward movement of heavy metals was slight for both waste forms under a variety of environmental conditions.

REFERENCE: EPA-600/2-77-014, PB 266-649, 1977, pp. 1-85.

For article on related subject see No. 154.

296. EFFECTS OF LEAD ON THE DECOMPOSITION OF ORGANIC MATTER

by

P. Doelman and L. Haanstra

This experiment studied the effects of lead on the decomposition of organic matter. The substances studied were glucose, starch, cellulose, glutamic acid, casimino acid and millipede excrements. Short range effects of lead were seen in all organic matter tested. Slight effects could still be seen in some cases up to two years later. The study concluded that lead pollution in these types of conditions may intensely affect the chemical breakdown of organic matter.

REFERENCE: Soil Bio. Biochem., Vol. 11, 1979, pp. 481-485.

297. EFFECTS OF NONIONIC SURFACTANTS ON MONOCOTS

by

R. M. Endo et al.

In this paper, the effects of Aqua Gro and Soil Penetrant, two commercial nonionic surfactants, on seed germination, shoot growth, and root growth of different monocots were studied in solution culture and soil. The plant species that were involved in the studies are barley, common ryegrass, creeping bentgrass, common bermuda, and Kentucky bluegrass. Of the two surfactants, both of them showed the results to be more toxic to plants in solution as compared to soil. The reason for this finding was becuase of adsorption of surfactant by soil thus reducing its toxicity. Except for a few cases, Soil Penetrant was found to be more toxic than Aqua Gro, mostly in the soil experiments. Some cytological observations suggest the effects may be on cellular membranes; however, the mode of action of either surfactant is not known.

REFERENCE: Agronomy Journal, Vol. 61, November/December 1969, pp. 850-854.

For article on related subject see No. 64.

298. EFFECTS OF SOME CHELATING AND PHENOLIC SUBSTANCES ON THE GROWTH OF EXCISED PEA ROOT SEGMENTS

by

P. C. DeKock and D. Vaughan

Substances such as 2,2'-dipyridyl, 8-hydroxyquinoline and desferal were selected from several chelating materials. The growth of extended periods of time was conducted with parts of pea root tips. The tip cultures were exposed to 2% sucrose and non-chelating analoque such as 2-hydroxyquinoline and 4,4'-dipyridyl and were without much effect. Phenolic, cinnamic, ferulic, chlorogenic and caffeic acids appeared to enhance growth. When elongation was apparent, so was intertase, but mostly peroxidase activity was increased. Cinnamic acid was incorporated into the cell walls continuously, which could only be partly removed by pronase, or $HClO_4$ and NaOH. Some radioactivity was transferred from cytoplasm and was not directly put into the walls.

REFERENCE: Planta, Vol. 126, 1975, pp. 187-195.

299. EFFECTS ON CORN BY APPLICATIONS OF HEATED ANAEROBICALLY DIGESTED SLUDGE

by

T. D. Hinesly et al.

A variety of hybrid corn grown in four 20 X 40 foot plots in a Gray-Brown Podzolic soil near Joliet, Illinois, were fertilized and repeatedly treated with heated anaerobically digested sludge in applications of 0, ¼, ½, and 1 inch. Samples of sludge, soil, and plant tissues were analyzed to determine nutrient and mineral accumulations and chemical changes. Acid-soluble phosphorus, sodium, chromium, copper, lead, nickel, zinc and cadmium increased in the upper 6 inches of the soil. Sodium, chromium, copper, zinc, manganese, lead and cadmium increased in the 12 to 18-inch depth. Analysis of plant tissues indicated increases in nitrogen, phosphorus, calcium, manganese, zinc, cadmium, boron, and magnesium. The elements did not accumulate to toxic levels. The application of large quantities of sludge was found to increase crop yields under most conditions.

REFERENCE: Compost Science, Vol. 13, No. 4, July/August 1972, pp. 26-30.

For articles on related subject see Nos. 66 and 167.

300. EVAPOTRANSPIRATION AND ITS CHEMICAL REDUCTION

by

William L. Powers et al.

This paper was produced to gain understanding of the natural event involving plants, soil, and climate that would lead to more adequate use of water, and to test the efficiency of various chemicals on reducing evapotranspiration. The report first looked at the laboratory experiments where several chemicals were screened for their potential in decreasing transpiration. Transpiration is water evaporation from the stomata of plant leaves; because of this, chemicals which partially close the stomata will reduce transpiration. Since the closing of the stomato may also reduce CO_2 diffusion into the plant, it also reduces photosynthesis and crop yield. Only plants treated with selected chemicals were measured of both photosynthesis and transpiration. A research site was constructed of a 5-acre tract of land located 2 miles southwest of Manhattan, Kansas, where two precision lysimeters were placed. In one study, in the summer of 1970, evapotranspiration from soybean and sorghum fields were tested. On an hourly basis, a model for evapotranspiration based on the resistance to vapor diffusion of a single leaf was measured.

REFERENCE: Kansas Water Resources Research Institute, June 1971, pp. 1-58.

For article on related subject see No. 67.

301. EXPERIMENTAL STUDIES ON THE FORMATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN PLANTS

by

J. Borneff et al.

This experiment showed the positive formation of polycyclic aromatic hydrocarbons (PAH) in a controlled study of algae growth. Algae grown using ^{14}C acetate as the primary carbon-source showed the adsorption of labeled carbon atoms by PAH-molecules to greatly stimulate growth. This may be the source of a significant portion of the distribution of carcinogenic hydrocarbons in nature. Data from this study shows in general the biosynthesis of PAH in plants.

REFERENCE: Environmental Research, Vol. 2, 1968, pp. 22-29.

302. EXPERIMENTS ON THE DEGRADATION OF NITROSAMINES BY PLANTS

by

J. Sander et al.

This study was concerned with the possible accumulation of nitrosamines in edible plants which may constitute dangerous carcinogenic or mutagenic N-nitroso compounds. Results showed some degree of nitrosamine absorption by plant roots; however, concentrations decrease rapidly with no further addition of nitrosamine. Although dangerous carcinogens may be formed from pesticides or fertilizers applied to soil, human contamination does not appear to result from plant consumption.

REFERENCE: International Agency for Research on Cancer, October 17-20, Lyon, France, pp. 205-210, 1973.

303. FACTORS INFLUENCING THE TOXICITY OF HEAVY METALS IN FOOD

by

Donald Huisingh and Joellen Huisigh

It is not easy to determine the level of heavy metals that can be ingested by man. The heavy metals that are of concern due to their wide distribution are mercury, cadmium, and lead. There are many factors that determine the absorption, transport, and biotransformations of heavy metals and their effects on man. This article discusses the influence of the form of the heavy metal on its toxicity, the ability of several elements to modify the toxicity of heavy metals, and the age and health status of the organism susceptible to the heavy metal.

This article suggests a need to set up a Standardized Food Monitoring Network to obtain information needed on forms and concentrations of the heavy metal and their effects on man.

REFERENCE: Ecology of Food and Nutrition, Vol. 3, 1974, pp. 263-272.

For articles on related subject see Nos. 28, 171, and 172.

304. FATE OF LABELED NITRATE AND AMMONIUM NITROGEN WHEN APPLIED TO GRASS AND CLOVER GROWN SEPARATELY AND TOGETHER

by

T. W. Walker et al.

Ammonium sulfate and potassium nitrate labeled with N15 and applied at various levels to grass and clover growing separate and together were tested for distribution of nitrogen in plant tops. Independent of plants grown, approximately 30% of labeled nitrogen was lost by denitrification due to trial conditions. Potassium nitrate had slightly higher losses. All cases show some nitrogen converted to soil organic nitrogen. Where clover was grown alone, more nitrogen was recovered from the soil than the plant themselves. With increased levels of combined nitrogen, more nitrogen was taken up and less fixed symbiotically by nitrogen fixating bacteria. Grass contained 95% of utilized nitrogen when grown with clover. There was no transference of nitrogen from grass to clover.

REFERENCE: Soil Science, Vol. 81, No. 5, 1956, pp. 339-351.

305. FATE OF 2,2'-DICHLOROBIPHENYL-^{14}C IN CARROTS, SUGAR BEETS, AND SOIL UNDER OUTDOOR CONDITIONS

by

Prannath Moza et al.

This experiment showed the behavior of 2,2'-dichlorobiphenyl-^{14}C when applied to soil growing carrots and sugar beets. Roots of the plants were analyzed to show the concentrations of dichlorobiphenyl and its metabolites in the plant tissue. A high percentage of the substance is lost due to volatilization from the soil. Cases in which high concentrations of the substance are present in the soil are probably the only conditions where lower chlorinated PCB contamination may occur.

REFERENCE: Journal Agri. Food Chemistry, Vol. 24, No. 4, 1976, pp. 881-884.

306. FLUORINE CONTENT OF PLANTS

by

W. H. MacIntire et al.

This study was based on questions relating fluoride fertilizers and forage crops. The testing was done to see what effect this forage would have on the livestock. Fluorides in great ranges of diversity were directly applied in the forms of phosphatic and liming materials. The toxicity had no significant effect upon the grass germination or intensity of fluorine. Future toxicity in plants appeared improbable due to the non-existent harm in first applied fluorines. This study was concluded by stating no harm will come to livestock feeding off the fertilized forage.

REFERENCE: Industrial and Engineering Chemistry, Vol. 34, No. 12, 1942, pp. 1469-1479.

For article on related subject see No. 66.

307. FOOD CHAIN ASPECTS OF THE USE OF ORGANIC RESIDUES

by

W. H. Allaway

This report discussed the use of organic wastes on crops and its effect on nutritional qualities. A number of elements which have been known to be potentially toxic are discussed in detail as to their concentrations in certain wastes as well as their possible effects on plants and animals. An outline is presented which gives the general procedures necessary for implementing an organic residue utilization system.

REFERENCE: Proceedings of Soils for Management of Organic Wastes and Waste Waters Symposium, 1975, pp. 282-298.

308. FRENCHING OF TOBACCO AND THALLIUM TOXICITY

by

Ernest L. Spencer

This experiment compared thallium toxicity with the frenching of tobacco plants. Results concluded that frenching of plant leaves was a result of thallium toxicity. The frenching, which thallium caused, was affected by plants grown in nutrient water cultures, sand, field soil and orchard soil. These are listed in sequence from lowest thallium concentration needed to produce chlorosis to the highest. Different plant species studied showed a correlation between frenching symptoms and thallium toxicity. Frenching was controlled by applications of nitrogen salts, aluminum sulfate solutions and potassium iodide.

REFERENCE: American Journal of Botany, Vol. 24, 1937, pp. 16-24.

309. FREQUENCY AND SPECTRUM OF CHLOROPHYLL MUTATIONS IN A SIX-ROWED BARLEY

by

R. Kumar and S. V. S. Chauhan

"Jyoti" was one of 6-rowed barley used with the highest frequency of chlorophyll mutation when looked at through NMU treatments (N-nitroso-n-methyl urea). The M_1 population mutants revealed a high level of male sterility, and a majority of these were viridis type. Ethyl-methane sulphonate (EMS) along with gamma rays provided maximum albinas. Comparing the mutagens, the NMU seemed to be basically different.

REFERENCE: Indian Journal of Agricultural Science, Vol. 49, November 1979, pp. 831-834.

310. FUNCTIONS OF MICRONUTRIENTS IN PLANTS

by

C. A. Price et al.

This report discussed several plant micronutrients by looking at the molecules in which the element exists. No evidence was found of any specific molecules containing either boron, manganese or zinc. However, manganese is present during photosynthesis, and zinc may be present in cytoplasmic ribosomes. Copper occurs in plant oxidases and various proteins. Iron occurs in various plant functions as an essential element and may be associated with the ribosomal RNA of chloroplasts.

REFERENCE: Soil Science Society of America, 1972, pp. 231-242.

311. FUNGICIDE MOVEMENT IN SOILS

by

Charles S. Helling

A number of fungicides were tested as to their mobility in the soil by leaching procedures. Cychloheximide, cycloheximide oxime, Ceresan L, Dexon, formetanate, forparanate, and oxycarboxin were shown to be relatively mobile compounds, while chloranil, chloroneb, DCNA, dichlone, dodine, hexachlorophere, Morestan, PCNB, TCNA, Terrazole, and zineb were the more immobile fungicides. In some cases, fungicidal mobility was related to the organic matter content of the soil.

REFERENCE: Phytopathology, Vol. 64, August 1974, pp. 1091-1100.

312. GROWTH AND NUTRIENT ABSORPTION OF APPLE, CHERRY, PEACH, AND GRAPE PLANTS AS INFLUENCE BY VARIOUS LEVELS OF CHLORIDE AND SULFATE

by

David R. Dilley et al.

Montmorency cherry was treated with chloride and sulfate one at a time and then as a combination. The Delicious apple, Elberta peach, and Concord grape were treated with a nutrient solution method. The outcome of this experiment provides information about growth increase and decrease of the four fruits mentioned.

A nine treatment mixture was devised with Hoagland's nutrients from a 3 level course of chloride and sulfate. It was accomplished without any metallic cation content breakdown. Anions from various chemicals were used to complete this solution. Growth of the trees and leaves were measured and weighed and, in addition, were analyzed for 12 elements ranging from nitrogen, phosphorus, potassium to calcium, magnesium, and iron. Growth began to decrease in the crops when chloride was increased, and peach developed a chloride toxicity. When sulfate was increased, it did not directly affect the trees growth, but depressed the cherry trees growth. The chloride level was lowered as an overall affect when sulfate and chloride were applied. Sulfur content in the plants was higher when chloride was absent, but when chloride was applied, the sulfate level dropped in all the crops. The elements found within the trees and plants were either lower or higher in proportion to the fruits. For example, manganese in cherry, apple, and peach increased when chloride solution increased. In the same 3 fruits, potassium decreased after chloride solution was applied. The calcium in cherry and peach decreased, magnesium in peach and grape, and in cherry alone, boron element decreased when chloride solution was applied. The only significant change with sulfate solution applied was the increase of boron in apple, peach, and cherry leaves. It did decrease calcium in cherry and peach leaves.

In conclusion, the reduced growth in these leaves may very well have been accountable for the ions taken in by the leaves instead of the chloride levels induced upon the plants.

REFERENCE: American Society for Horticultural Science, Vol. 72, November 19, 1957, pp. 65-73.

For article on related subject see No. 175.

313. GROWTH AND NUTRIENT RELATIONS OF A GRASS-LEGUME MIXTURE ON SODIC COAL-MINE SPOIL AS AFFECTED BY SOME AMENDMENTS

by

N. M. Safaya and M. K. Wali

A study was conducted over thickspike wheatgrass and yellow sweet clover with the intention of finding out the affects gypsum, fertilizers, and sulfuric acid had on nutrient deletions and growth of mixed crops. Nitrogen, phosphorus, and potassium were added to the two crops and increased the dry matter yield by 10 to 37 times. Wheatgrass crops were affected more by nitrogen and phosphorus, whereas, sweetclover only needed phosphorus. Nitrogen, phosphorus, and potassium, in addition to zinc, decreased sweetclover growth and the manganese in both plant species. Both species reacted against leonardite, which also correlated with potassium+/sodium+ ratios during calcium uptake. When phosphorus was applied, the extractability was higher from the leonardite treated spoil. Gypsum proved not to be as effective as sulfuric acid in sodium release in the sites of the spoils. Sulfuric acid enriched the phosphorus state in the plants, and yield in wheatgrass became larger with the application of 75 mg phosphorus/g spoil from phosphoric acid source.

REFERENCE: Soil Science Society America Journal, Vol. 43, 1979, pp. 747-753.

314. GROWTH RESPONSE OF CABBAGE PLANTS TO ARSENIC AND ANTIMONY UNDER WATER CULTURE CONDITIONS

by

Tetsuo Hara et al.

Nagaoka cabbage plants were grown and treated with graded levels of arsenic trioxide and antimony trioxide solutions. The plants were then harvested, dried, weighed and milled. Ash samples dissolved in HCL were tested with a spectrophotometer.

The dry weight of a plant decreased as levels of arsenic and antimony increased. Living plants showed symptoms of toxicity injury at 4 to 20 ppm arsenic solution and at 4 to 20 ppm antimony solution.

Increasing concentrations of arsenic and antimony solutions increased the content of both elements in the plants. The plants were found to be more tolerant to an excess of antimony than arsenic.

The behavior of these elements in other chemical forms may differ from these findings.

REFERENCE: Soil Science Plant Nutrition, Vol. 23, No. 2, 1977, pp. 253-255.

315. GROWTH RESPONSE OF CABBAGE PLANTS TO TRANSITION ELEMENTS UNDER WATER CULTURE CONDITIONS
II. COBALT, NICKEL, COPPER, ZINC, AND MOLYBDENUM

by

Tetsuo Hara et al.

A study was done to determine the growth response of water-cultured cabbage plants to the following ten transition elements: chromium, cobalt, copper, iron, manganese, molybdenum, nickel, titanium, vanadium, and zinc. The plants were found to be least tolerant to titanium and vanadium; slightly tolerant to copper, chromium, cobalt, and nickel; and most tolerant to manganese, iron, zinc, and molybdenum. Low level application of zinc and molybdenum increased yields slightly. However, high level applications of all transition elements used decreased plant yields. The study also stated that higher plant types may respond selectively to the elements if tested under a water-culture condition.

REFERENCE: Soil Science Plant Nutrition, Vol. 22, 1976, pp. 317-325.

316. HEAVY METAL ACCUMULATION AND GROWTH OF SEEDLINGS OF FIVE FOREST SPECIES AS INFLUENCED BY SOIL CADMIUM LEVEL

by

J. M. Kelly et al.

These tree seedlings, white pine, loblolly pine, yellow birch, yellow poplar, and choke cherry were planted in sand pretreated with cadmium, lead, copper, and zinc. Then more cadmium was added to each plant by soil introduction of cadmium chloride. Root and shoot growth were reduced in variance with species and soil cadmium concentration. Root and shoot uptake of the other metals were affected by species and soil cadmium concentration.

REFERENCE: Journal of Environmental Quality, Vol. 8, No. 3, 1979, pp. 361-364.

317. HEAVY METAL AVAILABILITY TO PLANTS FROM SLUDGE APPLICATION

by

R. F. Keefer et al.

A field experiment was conducted to compare the yield response of corn grown on two types of soil to two sewage sludges by determining the chemical composition of leaves, edible grain, and soil. A municipal sludge with little industrial waste and moisture of 18% was broadcast on a tilled and sweet corn-seeded, silt loam soil at 0, 10, 20, and 30 tons/acre. A municipal sludge with 59% moisture was spread on a tilled and field corn-seeded, sandy loam soil at 0, 9.45, 18.9, and 37.8 tons/acre. The sweet corn (harvested at milk stage) and the field corn (harvested at maturity) were analyzed for yield, and chemical analysis was made of grain, leaf, and soil samples. Sweet corn grown on the silt loam soil appeared unaffected by the application of sludge, while the field corn on the sandy loam soil was stunted and showed signs of nitrogen and potassium deficiencies. Only slight absorption of heavy metals was evident in the grain samples; small increases of cadmium and nickel appeared in the leaves. Both amounts were well below hazardous levels; however, heavy metals appeared to accumulate in soils to undesirable levels.

REFERENCE: Compost Science, May/June 1979, pp. 31-34.

318. HEAVY-METAL ION UPTAKE BY PLANTS FROM NUTRIENT SOLUTIONS WITH METAL IONS, PLANT SPECIES AND GROWTH PERIOD VARIATIONS

by

Olle Pettersson

Various crops were selected and analyzed for a period of one to two weeks with additions of heavy metals. The metals showing greatest motion were nickel, lead, and manganese. Translocation was not affected in the shoots of cucumber plants in the silver metals. Cadmium and nickel solutions increased the growth in roots and shoots 5-10 times in accordance with increasing the amount of metal ion concentration. Between the nickel and cadmium uptake, there were distinct differences in the roots and shoots of the oats, rape, wheat, and cucumber. Tomatoes had the greatest uptake of both cadmium and nickel. A noteable fact is that with age in a plant, the nickel and particularly the cadmium becomes greater.

REFERENCE: Plant and Soil, Vol. 45, 1976, pp. 445-459.

319. HEAVY METAL TOLERANCE IN PLANTS

by

R. G. Turner

A number of plants and microorganisms were tested to determine their resistance to various heavy metals, specifically zinc and copper. Metals entering the organisms tolerant to the substance were either expelled from the organism or made inactive by enzyme changes. Accumulation of heavy metals in the cell wall was also apparent.

REFERENCE: Ecological Aspects of Mineral Nutrition of Plants, 1969, pp. 399-410.

320. HYDROCARBON BIODEGRADATION IN ALASKAN WATERS

by

B. Robertson et al.

In Alaska's Cook Inlet and Port Valdez, groups of hydrocarbon-oxidizing organisms were found to be 1/cc and less in the Arctic Ocean. Distribution decreased with salinity in Cook Inlet and with depth in Port Valdez. Oxidation of ^{14}C-dodecone (91 μg C/liter) occurred within hours and continued at a rate of 1 μg/liter-day. Storage of Cook Inlet crude oil is seawater at 10°C for four years affected removal of most visible components. Oil slick stability was substantially affected after mixing. Silt, a major component component of Alaskan estuaries, had little affect on the solubilization process. Certain organisms had certain preferences for various parts of kerosene, emulsified crude oil and reacted in a normal way to incubation temperature, E_a 14.5 to 16 Kcal/male. Some effects of crude oil inhibition are discussed. Calculations show that for rapid slick inoculation, motility is necessary.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 171-184.

For articles on related subject see Nos. 75 and 176.

321. HYDROCARBON UTILIZATION BY CLADOSPORIUM RESINAE

by

J. J. Cooney and J. D. Walker

This report discussed two strains of the Cladosporium resinae organism, which is a filamentous fungi, and its use as a hydrocarbon-using organism. This type of fungi was found to grow on a variety of substrates. Slow growth resulted in hydrocarbon substrates, while limited growth was exhibited when fungi was grown on cyclic and aromatic compounds. Cellular hydrocarbons and fatty acids were both affected by growth substrates. This fungi resembled other types of microorganisms in several ways. C. resinae, however, did exhibit a competitive advantage over other types of organisms. This fungi may also be an efficient "seeding" organism because of the amount of hydrocarbons which could be metabolized with a relatively small biomass accumulation.

REFERENCE: The Microbial Degradation of Oil Pollutants, LSU-SG-73-01, 1973, pp. 25-32.

322. IMMOBILIZATION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD

by

D. E. Kissel et al.

In this nitrogen balance field study, immobilization was observed to be delayed compared to laboratory tests by several uncontrollable soil conditions. Immobilization can deprive growing plants of available nitrogen, especially when soil temperatures remain at 22°C or greater for 2 weeks. It is noted that nitrogen fertilizing could be helpful in soil having many cases of exhaustive cropping in their histories.

REFERENCE: Soil Science Society America Proceedings, Vol. 41, 1977, pp. 346-349.

323. INDUCTION OF CYCLOEXIMIDE-RESISTANT MUTANTS IN SACCHAROMYCES CERVISIAE WITH N-METHYL-N'-NITRO-N-NITROSOGUANIDINE AND ICR-170

by

David J. Brusick

N-Methy-N'-Nitor-N-Nitrosoguanidine and acridine mustard, (ICR-170) both have mutagenic effects on Saccharomyces cerevisiae. Specifically N-Methyl-N'-Nitro-N-Nitrosoguanidine treatment results in missense mutations, which lead to the loss of the ribosome binding sites of the antibiotic cycloheximide rendering the cell resistant to cycloheximide. ICR-170 treatment causes fram shift mutations that alter ribosome structure, but result in cell death.

REFERENCE: Journal of Bacteriology, Vol. 109, 1972, pp. 1134-1138.

324. INFLUENCE OF ALUMINUM ON PLANT GROWTH AND MINERAL NUTRITION OF POTATOES

by

C. R. Lee

Three experiments were conducted on eight potato varieties to determine the effect on plant growth and mineral nutrition. In Experiment 1, all potato varieties were grown in nutrient solutions containing 0 (as a control) and 20 ppm aluminum at pH 3.5. In Experiment 2, two potato varieties (Netted Gem and Sebago) were grown in nutrient solutions with 0, 1, 2, 5, and 10 ppm aluminum at pH 3.7. In Experiment 3, two potato varieties (Green Mountain and Katahdin) were grown in nutrient solutions of 0, 0.5, 1, 2, and 5 ppm aluminum at pH 3.8. After 14 days, plants were harvested and tested. All plants in Experiment 1 suffered effects of aluminum toxicity with decreased plant yield. However, aluminum at 1 to 5 ppm stimulated growth in some varieties. Content of other plant nutrients (calcium, phosphorus, manganese, iron, copper, zinc, magnesium and potassium) was also affected by aluminum. Aluminum tolerance among some varieties may be affected by the ability of the plant roots to absorb magnesium and potassium

REFERENCE: Agronomy Journal, Vol. 63, July-August 1971, pp. 604-608.

325. INFLUENCE OF ALUMINUM IONS ON DEVELOPMENT MORPHOLOGY OF SUGARBEET ROOTS

by

M. Keser et al.

Aluminum found in low pH soils in large quantities are known to be poisonous to sugarbeets. When concentration of aluminum was increased by 4, 8, and up to 12 ppm, the reaction was a reduction in root and plant growth. Evidence of this was a curved root system and the root cap expanded. The primary root had out breaks of abnormal lateral root growth. Complete examinations were done over the primary and lateral root system, and in the process, external materials were located. In acid soils, aluminum can serve as a decreaser of sugarbeet growth.

REFERENCE: Agronomy Journal, Vol. 67, January-February 1975, pp. 84-88.

326. THE INFLUENCE OF ARSENIC UPON THE BIOLOGICAL TRANSFORMATION OF NITROGEN IN SOILS

by

J. E. Greaves

Arsenic in various compounds was assessed as to its toxicity on nitrifying and ammonifying potential of soil. Sodium arsenate, zinc arsenate, lead arsenate, arsenic trisulfide, and Paris green slightly stimulated nitrification and in some cases ammonification. Large quantities of these compounds resulted in stopping or inhibiting the nitrifying and ammonifying capabilities of the soil. Lead arsenate appeared to be the least toxic, while Paris green showed the highest potential toxicity. The concentration required to cause adverse affects on soil activity were found in most cases to be higher than would ever be encountered in natural conditions.

REFERENCE: Biochemical Bulletin, Vol. 3, No. 9, 1913, pp. 2-16.

327. THE INFLUENCE OF CADMIUM IN THE SOIL ON THE YIELD OF VARIOUS PLANT SPECIES AND THEIR CADMIUM CONTENT

by

A. Kloke and H. D. Schenke

This study examined the influence of increasing amounts of cadmium on cadmium content and yield of various types of plants. The study concentrated on: 1. the difference in sensitivity between plant species, 2. the development of various toxic symptoms, and 3. the cadmium content of various plant parts. The range of sensitivity varied widely among the plants. Tomatoes were the least sensitive with sensitivity increasing in broccoli, oat, lettuce, ray grass, carrot, radish, bushbean, pea, and spinach being the most highly sensitive. Symptoms resulting from cadmium toxicity included discolored leaves, absence of fruit, stunted growth and deformed leaves. Relative yields of different plants varied greatly to cadmium applications. In most cases, cadmium content was found to be relatively low in seed, fruit and root areas, while high concentrations were frequently found in the leaf and straw portions.

REFERENCE: Z. Pflanzeneraehr. Bodenkd., Vol. 142, 1979, pp. 131-136.

328. INFLUENCE OF NITROGEN SOURCES IN THE FORMATION OF OXIDIZED AND REDUCED ORGANIC COMPOUNDS IN PLANTS

by

A. V. Vladimirov

Certain formulations can be made from the effect NH_4+, NO_2-, and NO_3- have on oxidized and reduced organic compounds in plants. N. rustica has a level of acidity that increases with nitrate nitrogen. When ammonia nitrogen is available, the acid level decreases. Through the changing process, the nitrate nitrogen helps in the plant organism formation. Ammonia nitrogen provides the reduction process. Within the plants are instilled the capacity of reduction with the lower the organic acid content, the higher the reduction. There is no loss of sugars under the ammonia nutrition combination, while is linked to nitrogenous compounds and organic acids. Citric and malic acids increase which under nitrate nutrition.

REFERENCE: Soil Science, Vol. 60, No. 4, 1945, pp. 265-275.

329. THE INFLUENCE OF SULFUR ON SOIL ACIDITY

by

H. Clay Lint

This experiment was concerned with the effects of sulfur application on soil conditions. The oxidation of essentially all of the sulfur content of soils tested was completed after eight or nine weeks. Similar experiments using both a heavy clay loam soil and a sandy loam soil showed sulfur in the sandy loam type soil to be most readily oxidized. The overall influence of sulfur on soil reaction appears to be related to texture, moisture, and bacterial content of the specific soil.

REFERENCE: Journal of Industrial and Engineering Chemistry, September 1914, pp. 747-748.

330. INFLUENCE OF TEMPERATURE UPON THE MICROBIOLOGICAL POPULATION AND DECOMPOSITION PROCESSES IN COMPOSTS OF STABLE MANURE

by

Selman A. Waksman et al.

This study was concerned with the effects of varying temperature on the decomposition of stable manure. Of interest were the hemicelluloses, celluloses, proteins, and lignins. Raising or lowering the temperature affected both the substance being degraded as well as which organisms were the most active. Nitrogen changes were quite significant with respect to temperature. Nitrification resulted only at the lower temperatures, and the loss of volatile forms of nitrogen occurred if degradation was inhibited.

REFERENCE: Soil Science, Vol. 47, 1939, pp. 83-113.

331. INFLUENCE OF THE PLANT ROOT ON ION MOVEMENT IN SOIL

by

Stanley A. Barber

This report concentrated on the properties of the soil immediately surrounding plant roots. Topics covered were: 1. physical properties of the soil, 2. ion distribution, 3. nutrient supply rates, and 4. ion accumulation influence on nutrient availability. In general, the study showed a marked difference between total soil characteristics and just that portion of soil adjacent to the root. The root itself can greatly alter the immediate environment as can fertilizers, soil, climate, etc.

REFERENCE: The Plant Root and the Environment, Vol. 1, 1974, pp. 523-554.

332. INHIBITION OF BACTERIAL CHEMORECEPTION BY HYDROCARBONS

by

F. Walsh and R. Mitchell

Bacterial cultures of Pseudomonas sp. were used to determine the effect of hydrocarbons on bacterial chemoreception. The hydrocarbons, which act as pollutants, appear to block the chemoreceptors to a certain extent depending on the hydrocarbon concentration. As concentrations become more concentrated, chemotactic response levels decrease. Efficiency of the bacteria in feeding and environmental adaptation may occur and may lead to a more resistant type species. The chemotactic response levels of polluted bacteria may be returned to its original state by washing the bacteria in fresh seawater.

REFERENCE: The Microbial Degradation of Oil Pollutants, LSU-SG-73-01, 1973, pp. 275-278.

333. INJURY TO GROWING CROPS CAUSED BY THE APPLICATION OF ARSENICAL COMPOUNDS TO THE SOIL

by

H. E. Morris

This experiment studied the effects of arsenic compounds on the growth of plants. Arsenic compounds when applied to the growth median, decreased transpiration rates with small concentrations and caused plant injury or death at higher concentrations. Different types of plants varied considerably in their ability to withstand arsenic applications with cereals and grasses being the most, and beans and cucumbers being the least resistant. Arsenic compounds in the form of arsenite were found to be considerably more toxic to plants than arsenic existing as arsenate.

REFERENCE: Journal of Agricultural Research, Vol. 34, No. 1, January 1, 1927, pp. 59-78.

334. THE INTERACTION OF COPPER AND SULPHUR DIOXIDE IN PLANT INJURY

by

P. M. A. Toivonen and G. Hofstra

This study determined the effects of copper and sulfur dioxide on Laurier barley. This type of plant was used because of its sensitivity to sulfur dioxide. When plants were treated with sulfur dioxide, the adverse affects consisted of necrotic streaking. Plants treated only with copper were found to have decreased root development and stunted plant growth. However, plants containing copper in the root median were found to have a significantly higher stomated resistance. Because of this, the adverse effects of sulfur dioxide on the copper containing plants were reduced.

REFERENCE: Canadian Journal of Plant Science, Vol. 59, April 1979, pp. 475-479.

335. INTERACTIONS OF LEAD AND CADMIUM ON METAL UPTAKE AND GROWTH OF CORN PLANTS

by

Joseph E. Miller et al.

When Pb and Cd was added to soil both together and separately, short term accumulation and growth effects of corn grown under greenhouse conditions were investigated. It was observed that soil Pb increased plant Cd and total Cd uptake of the corn shoots. The soil Cd reduced total Pb uptake and also the concentration. The two metals worked well together in promoting growth.

REFERENCE: Journal of Environmental Quality, Vol. 6, No. 1, 1977, pp. 18-20.

336. ISOLATION OF THE NITRIFYING ORGANISMS FROM SOIL

by

H. Lees

This experiment was designed to develop a method by which nitrifying organisms could be isolated from soil samples. This was accomplished by maintaining adequate aeration and beginning with a medium free of organisms. After a number of percolation procedures of the medium, the nitrifiers were obtained in a relatively pure form. This procedure was developed with the thought that it would provide adequate quantities of the nitrifiers to be throughly analyzed.

REFERENCE: Nature, Vol. 167, March 3, 1951, pp. 355-356.

337. KINETICS OF LOSSES OF PCNB AND DCNA IN THREE CALIFORNIA SOILS

by

C. H. Wang and F. E. Broadbent

The results of this study revealed that the fungicides PCNB (Pentachloronitrobenzene) and DNCA (2,6-Dichloro-4-Nitroaniline) were lost from three California soils according to first order kinetics. The persistence of the fungicides was measured by calculated half times in the three soils. High organic matter was linked to slowed PCNB loss, but conversely it caused greater DCNA loss. Clay content affected PCNB, and DCNA in a similar manner. PCNB loss was due mainly to volatilization, while DCNA loss due mainly to microbial degradation.

REFERENCE: Soil Science Society of America Proceedings, Vol. 36, 1972, pp. 742-745.

338. LANDFARMING SHOWS PROMISE FOR REFINERY WASTE DISPOSAL

by

H. E. Knowlton

Landfarming is a safe and effective method of disposal of many organic petroleum wastes. Oily sludges and biosolids (from less than 200 to more than 600 bbl year/acre) are spread several inches thick and cultivated at regular intervals to provide oxygen.

A landfarm site should be chosen carefully, so that it can be controlled and limited from surrounding environments as much as possible. However, when a landfarm site is monitored and controlled properly (oil content, nutrient content, and pH regulated), this can be a very effective disposal technique.

REFERENCE: Oil and Gas Journal, May 14, 1979, pp. 108-116.

For article on related subject see No. 79.

339. LEAD UPTAKE AND CORN GROWTH WITH SOIL-APPLIED LEAD

by

G. R. Baumhardt and L. F. Welch

Eight rates of lead ranging from 0 to 3,200 kg/ha were applied to a control field of corn. Many conditions of the corn were not affected with the lead applied to the soil. For example, the lead did not affect the sprouting, coloring, maturity or any other visual differences in the two years the corn was studied. The stover content increased in lead when studied. Lead contents of a young whole plant averaged between 2.4 and 37.8. For the leaves, the ppm ranged from 3.6 and 27.6. At the time the grain was harvested, the ppm factor was 4.2 and 20.4. The average lead content of the grains was 0.4 ppm and was not affected by the application of lead.

REFERENCE: Journal of Environmental Quality, Vol. 1, No. 1, 1972, pp. 92-94.

340. LEAD UPTAKE FROM SOLUTION BY PERENNIAL RYEGRASS AND ITS TRANSPORT FROM ROOTS TO SHOOTS

by

L. H. P. Jones et al.

Lead uptake in ryegrass grown in solution cultures was measured in all parts of the plants. It was concluded that the roots of growing ryegrass provide a barrier function that inhibits the transfer of lead to the parts of the plant above ground.

REFERENCE: Plant and Soil, Vol. 38, 1973, pp. 403-414.

341. THE MANGANESE CONTENT OF GRASSES AND ALFALFA FROM GRAZED PLOTS

by

Donald W. Bolin

This experiment consisted of analyzing eight different grasses to determine the manganese content of each. There was a significant difference in the concentrations of manganese between the varieties of grasses with alfalfa having the lowest. The grasses also varied in their manganese adsorbtion capabilities. Fusion of the plant ash with anhydrous sodium carbonate was the method used for analysis. The method recovered larger quantities of manganese than previously used methods.

REFERENCE: Journal of Agricultural Research, Vol. 48, No. 7, April 1, 1934, pp. 657-663.

For articles on related subject see Nos. 90 and 178.

342. MANGANESE STUDIES CALIF. SOILS AND CITRUS LEAF SYMPTOMS OF DEFICIENCY

by

H. D. Chapman et al.

This report is divided into two parts. The first part of the study showed manganese to be an essential element for the growth of alfalfa. This was followed by a procedure which assessed manganese deficiency symptoms on citrus leaves. Manganese deficiency symptoms resembled those of zinc deficiency and are increased by soil alkalinity. Control of these symptoms may be gained by controlling soil pH of neutral or slightly acidic levels.

REFERENCE: The California Citrograph, Vol. 24, November 1939, pp. 11, 15, 427, and 454.

343. MANGANESE TOXICITY EFFECTS ON LEAF CELL MULTIPLICATION AND EXPANSION AND ON DRY MATTER YIELD OF SUGAR BEETS

by

N. Terry et al.

The effect of manganese toxicity was tested on a group of hydroponically cultured sugar beets. Overall, the sugar beets were found to be more resistant to manganese poisoning than other previously tested types of plants. Low level manganese concentrations had no significant effects on plant growth, while higher applications decreased dry yields by as much as 50%. In addition, leaves affected by manganese toxicity were found to be smaller in size as compared to control plants. This is explained in that the leaves examined contained both fewer and smaller cells than unaffected plant leaves.

REFERENCE: Crop Science, Vol. 15, March-April 1975, pp. 205-208.

344. THE METABOLIC DETOXICATION OF 2,4-DINITROPHENOL BY FUSARIUM OXYSPORUM

by

Clarence Madhosingh

Fusarium oxysporum indicated in testing the power to reduce Dinitrophenol to a lower toxic nitrophenol. The two lesser toxics were 2-amino-4-nitrophenol and 4-amino-2-nitrophenol. Organisms can also reduce the compounds along with fusarium oxysporum. At a level of pH 7.1, Dinitrophenol had its largest amount of reduction. Sodium nitrate stimulated growth in fusarium oxysporum and caused Dinitrophenol to reduce to a level of 1.2%. Changes occurring in the experiments indicated a reversible nitro-reducing system. By Dinitrophenol decreasing, it indicates a threat to treated wood by wood-rotting fungi, and the tests must focus on preserving the wood.

REFERENCE: Canadian Journal of Microbiology, Vol. 7, 1961, pp. 553-567.

345. THE METABOLISM OF CYCLOHEXANOL BY ACINETOBACTER NCIB 9871

by

Nuala A. Donoghue and Peter W. Trudgill

Acinetobacter NCIB 9871, while unable to sustain itself on many alicyclic alcohols and keytones, did utilize cyclohexanol as its sole carbon source. The cells also significantly oxidized cyclohexane and at a slower rate 1-oxa-2 oxocycloheptane and 6-hydroxyhexanoate. The conversion of cyclohexanol to adipate was then shown. From this, several key intermediate aromatic compounds were distinguished.

REFERENCE: European Journal of Biochemistry, Vol. 60, 1975, pp. 1-7.

346. THE METABOLISM OF CYCLOHEXANOL BY NOCARDIA GLOBERULA CL1

by

D. B. Norris and P. W. Trudgill

This study was concerned with the metabolism of cyclohexanol and its oxygen uptake. The study determined the reaction sequency of cyclohexanol, which resulted in the formation of adipate that may be further oxidized. The first oxidation steps occurred quite simularly. However, further steps occurred more slowly, and adipate was not oxidized at all.

REFERENCE: Biochemistry Journal, Vol. 121, 1971, pp. 363-370.

347. METABOLISM OF O-PHTHALIC ACID BY DIFFERENT GRAM-NEGATIVE AND GRAM-POSITIVE SOIL BACTERIA

by

Gabriele Engelhardt et al.

This report characterizes and tentatively identifies different soil bacteria that can metabolize o-phthalic acid for growth. Benzoic acid, terephthalic acid, protocatechuic acid, salicylic acid, di- and mono-butyl phthalate were metabolized by some of the organisms. All organisms tested cleaned protocatechuate or catechol, respectively by the "ortho" fission when grown on phthalate, terephthalate, or hexyzoate as carbon source.

REFERENCE: Archives of Microbiology, Vol. 109, 1976, pp. 109-114.

348. MICROBIAL DEGRADATION OF AROMATIC HYDROCARBONS

by

D. T. Gibson and W. K. Yeh

Pseudomonas putida 39/D, Pseudomonas SP. strains, and Beiterincria B8/38 are mutagenic strains isolated from soil bacteria grown on benzene, toluene, ethylbenzene, naphthalene, and biphenyl. These specific strains were then grown on the aromatic hydrocarbons. The initial chemical reactions that took place in the bacterial strains oxidizing hydrocarbons were studied and related to mammalian oxidation of the same hydrocarbons. Resulting evidence suggested that these bacterial strains degrade hydrocarbons by use of an enzyme that fixes both oxygen atoms from O_2 to the hydrodiols eventually. Mammals oxidize hydrocarbons with only one oxygen atom producing arene oxides, which are more carcinogenic than their parent compounds and become trans-dihydrodiols eventually.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 33-38.

For articles on related subject see Nos. 91 and 179.

349. MICROBIAL DEGRADATION OF ASPHALT

by

R. W. Traxler

This report states that bacterial degradation of asphalts does occur. Temperature, pH, and oxygen tension influence asphalt degradation, but their importance varies as different organisms degrade asphalts by different enzymatic means. Also, the individual chemical components of the asphalt dictate which microorganisms can or cannot assimilate and degrade it.

REFERENCE: Biotechnology and Bioengineering, Vol. 4, 1962, pp. 369-376.

350. MICROBIAL DEGRADATION OF CRUDE OIL AND THE VARIOUS HYDROCARBON DERIVATIVES

by

D. L. S. Liu

This report is an attempt to supplement previous knowledge on crude oil and hydrocarbon degradation. Crude oil-grown bacteria were studied as to their efficiency in metabolizing these petroleum products using manometric and gas chromatographic methods. Both procedures were in agreement that n-alkanes were readily degradable by the studied bacteria. The manometric technique also confirmed the utilization of hydrocarbon alcohols, methyl ester of fatty acids and alkylbenzenes. However, this degradability potential of the bacteria cultures was inhibited in experiments conducted in the presence of benzene, toluene or ethyl benzene in the substrates.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 95-104.

351. MICROBIAL DEGRADATION OF HYDROCARBONS

by

David T. Gibson

This paper discusses the various types and sources of hydrocarbons and their ability to be microbiologically degraded. The biodegradation of both single and mixed hydrocarbon substrates is mentioned. Finally, the complex nature of crude oil biodegradation is discussed with emphasis on the types of compounds present, which are readily degradable. Parafins and various simple cyclic compounds are examples of this, which a number of polycyclic compounds are not easily removed from crude oil by microbial degradation.

REFERENCE: Dahlem Workshop on the Nature of Seawater, pp. 667-696.

352. MICROBIAL DEGRADATION OF OIL AND HYDROCARBONS IN CONTINUOUS CULTURE

by

P. H. Pritchard and T. J. Starr

Continuous culture techniques were shown to be of greater value than batch cultures because they more closely approximate conditions in an aquatic ecosystem. These open continuous culture experiments revealed data about the degradation of hydrocarbons and oil by microorganisms that was previously masked by extraneous artificial factors inherent with batch culture techniques. This new information will be important in the area of oil slick clean-up degradation.

REFERENCE: The Microbial Degradation of Oil Pollutants, Center for Wetland Resources, 1973, pp. 39-45.

353. MICROBIAL DEGRADATION OF OIL: PRESENT STATUS, PROBLEMS, AND PERSPECTIVES

by

C. E. ZoBell

At this time, 200 bacteria, yeasts, and fungi have been identified as hydrocarbon degrading microorganisms. The microorganisms can degrade simple hydrocarbons like methane and complex hydrocarbons containing 40 or more carbon atoms. Most microbial hydrocarbon degradation is through oxidation, and this paper summarizes kinds and occurrences of hydrocarbon oxidizers, hydrocarbons oxidized, factors affecting degradation of hydrocarbons, criteria for microbial degradation of specific hydrocarbons, products from hydrocarbon degradation, problems with microbial degradation, and new possibilities for the use of microorganisms for degrading hydrocarbons.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 3-16.

354. MICROBIAL DEGRADATION OF PESTICIDES

by

M. Alexander

Frequently, the only prevention of pesticides in an ecosystem is by microorganisms. Many times microorganisms govern the way pesticides behave in an environment. The degradation process caused products to form that were at times very toxic. If an intermediate was found in the persistent and toxic, then that suggests it is unsuitable as a substrate for microorganisms.

REFERENCE: Environmental Toxicology of Pesticides, Part V, 1972, pp. 365-383.

355. MICROBIAL DEGRADATION OF PLASTICIZERS

by

R. E. Klausmeier and W. A. Jones

The ability of a number of various types of plasticizers to support the growth of several different microorganisms was determined. Fatty acid derivatives, natural oils, and derivatives of lauric, oleic, ricinoleic, and stearic acids were the type of substrates supporting fungal growth. Aromatic hydrocarbons, a number of various esters, derivatives of toluenesulfonic acid, and certain glycol and glycolic acid derivatives did not support the growth of the organisms used.

REFERENCE: Development of Industrial Microbiology, 1960, pp. 47-53.

356. MICROBIAL DEGRADATION OF SOME POLYETHYLENE GLYCOLS

by

Donald P. Cox and Richard A. Conway

Microorganisms from the primary non-industrial sewage of Charleston were enriched with polyethylene glycol that had a molecular weight of 1540. Then to these enriched cultures was added CARBOWAX polyethylene glycol-200, polyethylene glycol 400, 600, 1000, 1540, methoxypolyethylene glycol 2000 and 5000, polyethylene glycol 6000, and 20,000. These cultures were incubated in reactors, then tested and measured as to growth, turbidity of biomass and weight of biomass, loss of polyethylene glycol from decreases in total organic carbon and loss of reaction to Burgers reagent on silica gel plates in thin layer chromatography analysis. It was shown that these polyethylene glycol 1540 enriched cultures could degrade other molecular weights of polyethylene glycol, not including PEG 6000 (unsubstituted) or methoxypolyethylene glycol 5000.

REFERENCE: Proceedings of the 3rd International Biodegradation Symposium of Applied Science Publications, 1976, pp. 835-841.

357. MICROBIAL ECOLOGY AND THE PROBLEM OF PETROLEUM DEGRADATION IN CHESAPEAKE BAY

by

R. R. Colwell et al.

Measurements were made of the number of petroleum-degrading microorganisms in water and sediment samples taken from Chesapeake Bay. These measurements were directly related to the oil concentrations in the samples, which varied considerably. Microorganisms taken from samples containing high oil concentrations produced higher yields when grown on an oil substrate, than organisms from weaker samples. Microorganisms studied proliferated on substrates representing aliphatic, aromatic, and refractory hydrocarbons. It is apparent that the microbial flora native to the area is what controls the microbial degradation of petroleum.

REFERENCE: The Microbial Degradation of Oil Pollutants, LSU-SG-73-01, 1973, pp. 185-197.

358. MICROBIAL HYDROXLATION OF 4-CHLOROBIPHENOL AND 4,4'-DICHLOROBIPHENYL

by

P. R. Wallnofer et al.

Because of the widespread occurrence of chlorobiphenyls in nature, the possible metabolism of these substances by microorganisms was studied. The experiment used 4-chlorobiphenyl, 4,4'-dichlorobiphenyl, and a certain species of soil fungus. Both substances contained radioactivity in the hydroxybiphenyl region of the chromatogram, while none was found in the mycelia extract.

REFERENCE: Chemosphere, No. 2, 1973, pp. 69-72.

359. THE MICROBIAL METABLOISM OF BIPHENYL

by

D. Lunt and W. C. Evans

This study was interested in the microbial degradation of biphenyl. The metabolism was traced to phenylpyruvate with some of the intermediate metabolites also being identified. The degradation of phenylpyruvate is already known. This knowledge may help provide a means of selecting biodegradable types of chlorinated biphenyls.

REFERENCE: Proceedings of the Biochemical Society, Vol. 118, 1970, pp. 54-55.

360. THE MICROBIAL METABOLISM OF NITRO-AROMATIC COMPOUNDS

by

R. B. Cain

In this study, species of Nocardia and Pseudomonas were isolated as being able to oxidatively metabolize nitrobenzoic acids and other aromatic compounds. The aspects of this metabolism are discussed herein. Three methods were available for estimation of the nitrobenzoic acids: 1. colorimetric, 2. photometric, and 3. chromatographic.

REFERENCE: Journal of General Microbiology, Vol. 19, 1958, pp. 1-14.

361. MICROBIAL UTILIZATION OF CARCINOGENIC HYDROCARBONS

by

Frederick D. Sisler and Claude E. ZoBell

This experiment was interested in the utilization of six carcinogenic compounds by marine organisms. The apparatus was constructed to collect the carbon dioxide after decomposition from which the total amount of hydrocarbons oxidized could be calculated. High oxidation rates were found, and it is assumed that oxidation would continue over a longer incubation period. Research of this type may be beneficial in finding an effective treatment for cancer.

REFERENCE: Science, Vol. 106, November 28, 1947, pp. 521-522.

362. MICROBIAL UTILIZATION OF HYDROCARBONS

by

H. F. Haas et al.

Certain molds and isolated bacteria were shown to be capable of utilizing petroleum products as a carbon and energy source. Hydrocarbons subject to metabolism included light petroleum, mineral oil and wax. By-products of this metabolism from respiration were carbon dioxide and water. Molds, in some cases, were found to produce sterols.

REFERENCE: Transactions Kansas Academy of Science, Vol. 44, 1941, pp. 39-45.

363. THE MICROBIOLOGICAL DEGRADATION OF PLASTICIZERS
I. GROWTH ON ESTERS AND ALCOHOLS

by

William H. Stahl and Helmut Pessen

This report showed that Aspergillus versicolor and Pseudomonas aeruginosa were common plasticizer degrading organisms. These two organisms were grown on several different substrates such as esters with 3 to 18 carbon atom alkyls, fatty-oil plasticizers, alcohols, and plasticizers with chain branching. The observations revealed that structural modifications that would retard the growth of the fungus Aspergillus versicolor and, therefore, the degradation of the plasticizers it uses for food would not necessarily retard the growth of the bacterium Pseudomonas aeruginosa using the same plasticizer, and the converse was also found to be true.

REFERENCE: Applied Microbiology, 1953, pp. 30-35.

364. THE MOBILIZATION AND FIXATION OF MOLYBDENUM, VANADIUM, AND URANIUM BY DECOMPOSING PLANT MATTER

by

C. Bloomfield and W. I. Kelso

Decomposing plant matter was broken down through an aerobic process causing molybdenum, uranium, and vanadium to draw together as anions. This process was not a usual occurrence due to the differences in dissolved metals. Molybdenum in mobilized form was fixed by colloidal organic decomposition at a pH level of 1·5. Vanadium was similar to molybdenum with the exception of retention ranging between 1·5 and 7·0, at a maxiumum of pH 3. Vanadium and molybdenum in a particular fixation was much lower and consistently ranged in pH values of 1·5 - 6·5 and 1·0 - 9·0. Uranium was set by humified organic matter at a pH maximum of 4-5. Even though organic matter was higher than molecular size, decomposed products both had the same number of amino acids, and they were in proportion.

REFERENCE: Journal of Soil Science, Vol. 24, No. 3, 1973, pp. 368-379.

365. MODIFICATIONS OF THE SOIL FLORA INDUCED BY APPLICATIONS OF CRUDE PETROLEUM

by

I. L. Baldwin

This study investigated the effects which applications of crude petroleum have on soil flora. The majority of bacterial species were found to be inhibited by the application, while a few varieties were stimulated significantly. Mold growth was not affected adversely. Ammonia production was lowered to a small amount. Nitrate production, however, was completely inhibited, but was found to recover after a period of time depending on application size. In most cases, large applications have produced harmful effects on the soils physical state, while smaller applications are eventually broken down returning the soil to its original condition.

REFERENCE: Soil Science, January 11, 1922, pp. 465-477.

366. MOLYBDNEUM IN RELATION TO GROWTH OF HIGHER PLANTS AND MICRO-ORGANISMS

by

E. G. Mulder

A series of experiments were conducted to determine the relationship between molybdenum and plant growth. Ironstone soils having a low available molybdenum content were used along with a variety of leguminous and non-leguminous plants. In leguminous plants, the fixation of atmospheric nitrogen was the most noteworthy symptom of molybdenum deficiency. In the non-leguminous plants, various severe symptoms were often found in the early stages of plant growth. Upon treatment of the deficient plants with molybdenum, nearly all varieties showed growth improvement of some kind. A number of the plants studied were also found to exhibit a reduction in nitrates as a result of molybdenum deficiency.

REFERENCE: Plant and Soil, Vol. 4, October 1954, pp. 368-415.

For article on related subject see No. 95.

367. MOLYBDENUM NUTRITION OF CROP PLANTS
I. THE INFLUENCE OF PHOSPHATE AND SULFATE ON THE ABSORPTION OF MOLYBDENUM FROM SOILS AND SOLUTION CULTURES

by

P. R. Stout et al.

One pound per acre of molybdenum deposited to the soil as $NA_2M_0O_4$ was shown in large amounts in plants absorbing molybdenum. In some cases where the phosphate levels were intensified, the molybdenum consumption was increased as much as 10 fold. In low concentrate cultural solutions, plants were able to draw out molybdenum. Experiments with radio active molybdenum did show absorption of 1 ppb from cultural solutions and transferred to the upper parts of the plant. The ions of molybdate are divalent and are the same size of sulfates. Therefore, it is believed these two ions compete for the spot of absorption of the roots of these plants. Contrary to what is expected, the phosphates were diametrically different in the physical chemical interchanges between anions. Soil molybdenum is stronger set when in acid reaction, but cultural solutions absorb molybdenum through plants at greater amounts in acid solutions than in neutral reaction solutions. Liming tends to cause greater adsorption within acid soils which suggests the concentration of available soil molybdenum is sufficient enough to surmount the lack of ability to absorb molybdate from increasing alkaline media. Phosphates are of such nature that they can easily be changed by moderate quantities of phosphate fertilizer or fertilization.

REFERENCE: Plant and Soil III, Vol. 3, No. 1, January 1951, pp. 51-87.

368. MOLYBDENUM STATUS OF UNITED STATES SOILS AND PLANTS CHAPTER 6

by

Joe Kubota

It is proposed the soils in the United States has a median concentration of molybdenum that ranges a little more than 1 ppm and varies from 0.08 to over 30 ppm. Molybdenum is less in the eastern soils due to glacial and marine origins in the sandy materials. One exception is found in the Allegheny Plateau region because of the shale present. Shale and granite are molybdenums main rock source in western soils. Decreasing of molybdenum concentrations are most evident in plants from the western to the eastern United States. (East median of 6 ppm, West median of about 5 ppm.) Patterns of plant concentration parallel somewhat with the distribution of neutral to alkaline, often calcareous soils from the west and the eastern soils being acidic due to moisture occupied areas. The molybdenum-toxic areas in the west used for grazing are seldom many because of narrow floodplains and alluvial fans of small streams. Most often the deficiencies of molybdenum in crop plants are primarily found in acid soil areas.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 555-581.

369. NITRATE CONTENT OF PERCOLATES FROM MANURED LYSIMETERS

by

D. G. Bielby et al.

This experiment determined the nitrate content of percolates from manured lysimeters using corn as the primary crop. The majority of nitrates that were discharged by either manured or nonmanured lysimeters did so after crop harvest. The tests concluded that the nitrogen contained in percolates and that removed by corn consisted of less than 25% of the total application amount.

REFERENCE: Journal of Soil and Water Conservation, May-June 1973, pp. 124-126.

For articles on related subject see Nos. 100, 101, and 182.

370. N-NITROSAMINE FORMATION BY CULTURES OF SEVERAL MICROORGANISMS

by

A. L. Mills and M. Alexander

Pseudomonas stutzeri was the only one of 30 cultures able to form dimethylnitrosamine. Dimethylamine and nitrite were used in order to make the formation during growth. Certain microorganisms were capable of forming dimethylnitrosamine, but without nitrosamine. Nitrosamine was not formed in Pseudomones fragi nor Proteus mirabilis. Also found in the study were boiled cells of stutzeri that formed dimethylnitrosamine. Nitrosamine was also made by extracts of Escherichia coli when the cell's pH reached 5.0.

REFERENCE: Applied and Environmental Microbiology, Vol. 31, June 1976, pp. 892-895.

371. N-NITROSAMINES: ABSENCE FROM SAUERKRAUT AND SILAGE

by

Robert L. Tate III and Martin Alexander

Raw corn silage and silage treated with increased amounts of nitrates were tested for volatile nitrosamine content. Similar analyses were conducted on several sauerkraut varieties, some with increased nitrate or nitrite concentrations. No volatile nitrosamines were detected in any of the cases mentioned. The hypothesis could be made from this study that even when nitrate-rich plants are used, it is improbable that nitrosamine formation will occur.

REFERENCE: Journal of Agricultural Food Chemistry, Vol. 23, No. 5, 1975, pp. 896-897.

372. NONIONIC SURFACTANT EFFECTS ON GROWTH AND POROSITY OF BARLEY ROOTS

by

R. J. Luxmoore et al.

Nonionic surfactant substances were added to solution and soil cultures in which the barley (Hordeum Vulare L.) was growing to evaluate the surfactant effects on the growth and porosity of the barley roots. The surfactants were toxic on solution to the roots causing reduced dry weights and a decrease in root porosity. But in soil cultures, a soil showing a high surfactant adsorption reduced the toxicity to the roots.

REFERENCE: Agronomy Journal, Vol. 66, 1974, pp. 673-675.

For article on related subject see No. 102.

373. NUMERICAL TAXONOMY AND ECOLOGY OF PETROLEUM-DEGRADING BACTERIA

by

B. Austin et al.

By the use of numerical taxonomy, 99 strains of petroleum-degrading bacteria from Chesapeake Bay water and sediment were identified. Forty-eight biological, cultural, physiological, and morphological characteristics of these bacteria along with 33 reference cultures were examined. Computer analysis of these utilized both simple matching and the Jaccard coefficients. By use of the unweighted average linkage method, clustering was achieved. Fourteen phenetic groups made up of 85 of the petroleum-degrading bacteria were defined at the 80% similarity level from the sorted similarity matrix and dendrogram. The groups identified were actinamycetes, caryneforms, Nacardai species and Sphaeratilus natans. In conclusion, the degradation of petroleum is accomplished by a wide range of bacterial taxa, those isolated only at a given station and those from sediment collected at a given station.

REFERENCE: Applied and Environmental Microbiology, Vol. 34, No. 1, July 1977, pp. 60-68.

374. ON RUBIDIUM CONCENTRATION IN PLANTS. II

by

T. Borovick-Ramanova

This report presents analytical data showing the presence of rubidium in plants. A wide variety of plants were tested using spectrum analysis. Rubidium was found in relatively equal amounts between fresh-water, salt-water, and land plants despite variations in the rubidium concentrations of the different mediums. It was found, however, that plants remove rubidium and potassium in nearly equal ratios of that in the soil.

REFERENCE: Comp. Rend. Acad. Sci. U.S.S.R., Vol. 44, No. 7, 1944, pp. 285-288.

375. ON THE ACTION OF CERTAIN COMPOUNDS OF ZINC, ARSENIC, AND BORON ON THE GROWTH OF PLANTS

by

Winifred E. Brenchley

This experiment determined the effects of various concentrations of zinc, arsenic, and boron compounds on plant growth. Zinc sulfate and arsenic compounds were both extremely toxic to plants even at very low concentrations. Small and moderate levels of boric acid showed some type of growth stimulation in plants, but toxicity symptoms did appear at the higher concentrations.

REFERENCE: Annals of Botany, Vol. 28, April 1914, pp. 283-301.

376. THE OXIDATION OF PIPECOLIC ACID IN PREINCUBATED SOILS

by

M. A. Guirguis and V. Vancura

A number of substrates were added to soil samples to determine their effects on the oxidation of pipecolic acid. The curve representing pipecolic acid oxidation showed two peaks after incubation with various substrates, while one peak was all that was present in control samples. The level of carbon in the soil was also found to be an important factor for influencing chemical oxidation.

REFERENCE: Folia Microbiologica, Vol. 15, 1970, pp. 459-467.

For article on related subject see No. 104.

377. OXIDATION-REDUCTION POTENTIALS OF ARSENATE-ARSENITE SYSTEMS IN SAND AND SOIL MEDIUMS

by

Clark M. Keaton and L. T. Kardos

Oxidation-reduction potentials were studied on the arsenate-arsenite system. Overall, it was noted that Peters' equation is valid for the system. Also, addition of ferric oxide oxidized the arsenic to the arsenate form. This is of most importance when arsenic contaminates soil because this oxidation fixes the arsenite to arsenate, which allows crops to grow normally in the soil once contaminated.

REFERENCE: Soil Science, Vol. 50, 1940, pp. 189-207.

For article on related subject see No. 184.

378. OXIDATIVE METABOLISM OF NAPHTHALENE BY SOIL PSEUDOMONADS

by

J. L. Davies and W. C. Evans

This paper confirmed and outlined the metabolism of naphthalene by soil microorganisms. Stages of this process include: 1. ring-cleavage, 2. ring-fission products and their properties, 3. this product's isomerization, and 4. the presence of a NAD-specific dehydrogenase and its oxidation. This was the general metabolic system in effect with any napthalene-utilizing microorganism.

REFERENCE: Biochemical Journal, Vol. 91, 1964, pp. 251-261.

379. PARTIAL STERILIZATION OF SOIL, MICROBIOLOGICAL ACTIVITIES AND SOIL FERTILITY: 1

by

Selman A. Waksman and Robert L. Starkey

This report discusses the effects of toluene and heat on the microbiological populations of various soils. Bacteria and fungi were found to increase in numbers as were ammonia accumulations. Noticeable effects were also shown on protozoa and actinomycetes in the soil samples. The roles played by fungi and actinomycetes seem to be important factors in the decomposition of organic material and growth of soil microorganisms.

REFERENCE: Soil Science, Vol. 16, 1923, pp. 137-157.

For articles on related subject see No. 105.

380. PENTACHLORONITROBENZENE RESIDUES IN POTATOES

by

Siegbert Gorbach and Ulike Wagner

Pentachloronitrobenzene (PCNB) was found in the peels and tissue immediately under the peel of potatoes grown in (PCNB) treated soil. Two other metabolites were found to be present in the potatoes; one was identified as pentachloroaniline. The conclusion was made that the formation of metabolites occurred before the substance entered the peel of the potato.

REFERENCE: Journal of Agriculture Food Chemistry, Vol. 15, No. 4, July/August, pp. 654-656.

381. THE PERSISTENCE AND BIOLOGICAL EFFECTS OF ANTIBIOTICS IN SOIL

by

D. Pramer

This report was concerned with the effects of antibiotics when introduced to the soil. Most antibiotics are readily degradable in soil. The ones tested showed small amounts of activity due to chemical instability, absorption by the soil, and/or microbial degradation. Results of field and laboratory studies varied considerably where microbial population was concerned with field sites requiring much higher antibiotic concentrations to produce the same results. Effects on plant and seed development were evident, but at higher concentrations than were determined under laboratory conditions. The effects of using antibiotics as soil ammendments are still not predictable.

REFERENCE: Applied Microbiology, Vol. 6, 1958, pp. 221-224.

382. PHYSICAL-CHEMICAL CHARACTERISTICS AND HEAVY METAL CONTENT OF CORN GROWN ON SLUDGE-TREATED STRIP-MINE SOIL

by

William J. Garcia et al.

In this study, corn was grown in strip-mine soil and on adjacent strip-mine soil that was treated with anaerobically digested liquid sludge. The corn grain, cobs, and husks from the crops were compared, and results showed that the corn grown on strip-mine soil alone was of poor quality, with low yield. Conversely, the crop grown on the sludge treated strip-mine soil was comparable to commercial-grade corn nutritionally and in kernel size, and the yield was four times that of the other crop. There were small differences in amounts of the heavy metals zinc, manganese, copper, lead, chromium, cadmium, and mercury present in the corn grain, cobs, and husks of the different crops, but these amounts were not excessive by comparison with the heavy metal content in 11 other corn varieties grown under normal conditions.

REFERENCE: Journal of Agricultural Food Chemistry, Vol. 22, No. 5, 1974, pp. 810-815.

For article on related subject see No. 185.

383. PHYSIOLOGICAL STUDIES IN PLANT NUTRITION

by

F. J. Richards

This experiment studied the effects which rubidium accompanied with low potassium has on plant nutrition. Results of the experiments gave symptoms associated with excess rubidium including short, thick roots, waxy leaves and usually results in premature death. The study then examines the interaction of phosphorus, potassium and rubidium in various combinations on plant growth and plant yield.

REFERENCE: Annals of Botony, N.S., Vol. 5, April 1941, pp. 263-296.

384. PHYTOTOXICITY OF ZINC, NICKEL, CADMIUM, LEAD, COPPER AND CHROMIUM IN THREE PASTURE PLANT SPECIES SUPPLIED WITH GRADUATED AMOUNTS FROM THE SOIL

by

W. Dijkshoorn et al.

Three pasture plants were grown on acid sandy soil in addition to zinc, nickel, cadmium, lead, copper and chromium being applied. Metals were classified for inhibitive metal concentrations in the narrow-leafed plantain, white clover and perennial ryegrass, and in the soil. Covering a fivefold range was nickel, cadmium, and copper, although cadmium in the plantain was hindering at a level of tenfold, tissue concentration compared to clover and grass. The most efficiently absorbed metal was zinc, and it tolerated higher levels of soil intensification due to less toxicity toward the tissues. Chromium was taken in at lower levels of concentration, but at higher levels in soil because its roots were smaller during uptake. Relative uptake and shoot concentration was actually the difference between plant species and response to soil test levels for toxicity.

REFERENCE: Neth. Journal Agricultural Science, Vol. 27, 1979, pp. 241-253.

385. PLANT UPTAKE AND LEACHING OF DIMETHYLNITROSAMINE

by

Deborah Dean-Raymond and M. Alexander

This report discussed the behavior of dimethylnitrosamine in the soil and its uptake by plants. Data showed the assimilation of dimethylnitrosamine (DMNA) by both lettuce and spinach plants. Other data which is in agreement with previous studies also shows the potential for nitrosamine formation and movement in the soil and groundwater.

REFERENCE: Nature, Vol. 262, July 29, 1976, pp. 394-396.

For article on related subject see No. 108.

386. PLANT UTILIZATION OF ZINC FROM VARIOUS TYPES OF ZINC COMPOUNDS AND FERTILIZER MATERIALS

by

Louis C. Boawn et al.

Various tests were conducted over zinc and eight compounds of zinc. The compound $ZnSO_4$ was used in all the analyses as a form of evaluation. The tests involved growing potted plants in which zinc compounds were administered. The greatest use came from chelate with $ZnSO_4$ added. The other compounds compared about the same as with $ZnSO_4$. While certain slag increased the zinc level, other experiments showed no use at all from zinc in frit materials. Based on the fact that only one crop was used in the experiment, the evaluation of residual effectiveness could not be administered.

REFERENCE: Soil Science, Vol. 83, 1957, pp. 219-229.

387. THE PLASTOCHRON INDEX AS APPLIED TO A CADMIUM TOXICITY STUDY

by

Robert J. Lamoreaux et al.

The Honeylocust leaf was tested for what affect low levels of cadmium ranging from 0 to 2.0 ppm of cadmium^{2+} concentration would have on the development of the seedlings. After 12 weeks, the seedlings of dry weight roots were found to be greatly reduced with cadmium^{2+} of 1.0 and 2.0 ppm. The leaf and stem did not indicate much reduction with similar cadmium^{2+} levels. There resulted very little difference between the leaf, root, and stem dry weight other than the growth was reduced in the leaf from the cadmium^{2+} concentration. Plastochron Index allowed seedlings with cadmium^{2+} treatment to acquire the morphological age of untreated seedlings.

REFERENCE: Environmental Pollution, Vol. 16, 1978, pp. 311-317.

388. POSSIBLE MICROBIAL CONTRIBUTION TO NITROSAMINE FORMATION IN SEWAGE AND SOIL

by

Abateni Ayanaba et al.

This report discussed the potential formation of nitrosamine by microorganisms present in sewage. Trimethylamine was converted to dimethylamine (DMA). Sewage microorganisms were subsequently found to form nitrosamine from DMA and nitrite in certain neutral pH and acid environments. This data indicates the potential danger of nitrosamine formation in sewage and soil.

REFERENCE: Journal of the National Cancer Institute, Vol. 50, No. 3, March 1973, pp. 811-813.

389. A PRELIMINARY NOTE ON THE RELATION OF ZINC TO DISEASE IN CEREALS

by

C. R. Millikan

Experiments for control of eelworm and root rot disease were conducted with growth samples of wheat from the field and sand. The wheat tested showed comparatively superior growth with the addition of zinc sulphate. For a certain measure of application, testing was done in order to know to what affect superphosphate linked with zinc sulphate has on growth of wheat. Significantly, the heaviest infested areas show more improvement in early maturation and darker colouring in spite of infestation of Heterodena Schachtii. The superphosphate in application of 15 and 30 pounds of zinc sulphate appeared to influence the wheat more so than the single application of superphosphate only. Growth of wheat headed around two weeks before its expected time of maturation. In addition, the zinc treatment did not prevent the eelworm of root rot diseases, but gave the wheat stock enough strength to be productive in a superior kind of wax. It was also found that the zinc had the same affect on oats as that of wheat.

A remarkable difference between wheat grown in the field and wheat in sand cultures became evident after zinc was applied to each. The nutrient solution did not increase growth or colour in the wheat in sand cultures. Curvularia Ramosa and Helmiathosporium Sativum when grown on glucose agar, induced quite a variation when zinc was applied. In conclusion, baking and milling qualities had no important influence on wheat.

REFERENCE: Journal of Agriculture, Victoria, Vol. 36, August 1938, pp. 409-416.

390. PROCEDURE FOR THE DETERMINATION OF EXCHANGEABLE COPPER AND MOLYBDENUM IN PODZOL SOILS

by

Umesh C. Gupta and D. C. Mackay

Four reagent factors, 0.2M ammonium oxalate (pH 3.0), 0.1 N HCl, 0.1 N NaOH, and 2% citric acid solution were used as extracts for exchange between copper and molybdenum on some podzol soils from Eastern Canada. Out of the four, HCL proved inefficient for molybdenum. Likewise, citric acid proved poorly on copper. HCl and NaOH were intermediates for copper. Intermediates for molybdenum worked out as NaOH and citric acid. Indirect and direct extractions were made on the effect of removing organic matter from both elements. The "direct" affected failed due to copper and molybdenum in the ammonium oxalate; citric acid and molybdenum in NaOH worked as interferring solutions. Time limits for shaking was set up to 16 hours. Any further extractions after this time produced negligible amounts. From the test, 0.2M ammonium oxalate with a pH of 3.0 was determined the best reagent for exchange between copper and molybdenum.

In conclusion, there are three important factors that prove the reasoning for the above. First, the extractant is easily prepared. Second, there is sufficient buffering to prevent the pH soil from extracting any material change. The third reason is it is a stable complex between copper and molybdenum

REFERENCE: Soil Science, Vol. 101, 1966, pp. 93-97.

391. PRODUCTION OF NON-FOOD-CHAIN CROPS WITH SEWAGE SLUDGE

by

Lilia A. Abron-Robinson et al.

Because sewage sludge contains high concentrations of plant nutrients and organic matter, a study was done to look at the possibility of cultivating non-food-chain crops (NFCC) with it. Sewage sludge as a fertilizer is primarily used for the addition of nitrogen and phosphorus to the soil. It is also beneficial in improving the water holding capacity of soils. Application of the sludge was carried out by three methods--injection, surface irrigation, and truck spreading. Of these, injection is the most expensive and truck spreading the least expensive. It was concluded that sewage sludge could be used to supplement or to replace fertilizers in non-food-chain crops.

REFERENCE: EPA Municipal Environmental Research, EPA-600/S2-80-199, March 1981, pp. 1-3.

392. PULP AND PAPER MILL SLUDGE DISPOSAL AND CROP PRODUCTION

by

Thomas R. Aspitarte et al.

Primary treatment plant sludge from pulp and paper manufacturing can be disposed of successfully by ammending farm soil within or combining it with bark to form a hydromulch to establish grass on and hold steep embankments. However, if crop production is to maintain original yields or increased yields on ammended farm soils, the yearly ton/acre rates of application and percentages of solids content in the sludge must be closely regulated to insure proper site function. Findings of different application rates and solids content in relation to soil quality and crop yield are included in the report.

REFERENCE: Tappi, Vol. 56, No. 11, 1973, pp. 140-145.

393. RELATION OF AN ESSENTIAL MICRO-ELEMENT TO SEED PRODUCTION IN PEAS

by

Howard S. Reed

Peas were grown under different concentrations of zinc to determine its role as an essential micro-element. Plants receiving only small amounts of zinc produced dificiency symptoms, such as growth reduction of the plant and seed deformities. Larger applications of zinc resulted in normal plant growth with the seed yields by weight increasing with increasing zinc concentrations up to the amounts tested in this experiment.

REFERENCE: Growth, Vol. 6, 1942, pp. 391-398.

For articles on related subject see Nos. 112 and 113.

394. RELATIONSHIP AMONG EXPOSURE PERIODS, FOLIAR BURN, AND FLUORINE CONTENT OF PLANTS EXPOSED TO HYDROGEN FLUORIDE

by

D. F. Adams et al.

In some agricultural areas, low levels of fluorides were found due to industrial gases. Fluorides were accounted for pathological conditions in various plants and began a series of fumigation experiments. They were done in order to find environmental variable effects on foliar responsive rate to hydrogen fluoride fumigation. Selective plants were exposed to atmospheric levels of hydrogen fluoride of up to 1.5, 5, and 10 parts per billion. A correlation was set up between light and dark exposure and gathered foliar fluoride concentration for family, species, and genus. Hydrogen fluoride in darkness accounted for the varieties fumigated at an average of 91.3%. The fumigation proved to be more responsive at the daily low level than at a span of twice a week with high concentrations of about equal exposure factor.

REFERENCE: Journal of Agriculture and Food Chemistry, Vol. 5, 1957, pp. 108-116.

395. RELATIONSHIP BETWEEN NITRATE, NITRITE, AND NITROSAMINES IN PLANTS AND SOIL

by

Jurgen Dressel

Determinations of whether intensive nitrogen dressings lead to formation of nitrosamines in plants were made in this study. Both cereals and vegetables showed negative results. The nitrosamines were apparently degraded by microbes and proceeded by evapotranspiration.

REFERENCE: Quality Plant., XXV, 3/4, 1976, pp. 381-390.

396. RESIDUES OF PENTACHLORONITROBENZENE AND RELATED COMPOUNDS IN GREENHOUSE SOILS

by

R. H. De Vos et al.

Greenhouse used Pentachloronitrobenzene as a soil fungicide. It was beneficial for controlling Rhizoctonia and Botrytis in lettuce.

A gas liquid chromatography examination of several samples of soil revealed a PCNB peak in the chromatograms and several other peaks, which were probably related to that compound. Mass spectrometry was used to identify those peaks.

REFERENCE: Bulletin of Environmental Contamination & Toxicology, Vol. 11, No. 6, 1974, pp. 567-571.

397. RESPONSE OF CROP PLANTS TO I AND Br

by

Harvey P. Newton and Stephen J. Toth

A total of nine samplings of soil were taken from the New Jersey area in which potassium iodine was present by application. Tomatoes and Buckwheat were tested for iodine and remaining effects of iodine being applied. Solution-culture procedures were used to test the iodine-chlorine and iodine-bromine relationships in tomatoes. When iodine was applied on Norton, Lakewood, Lawrenceville, and Washington soils at a rate of 10 pounds an acre, it was toxic to the tomatoes. Whereas, iodine applied from 1 to 10 pounds an acre had no yield responses on the growth of the tomatoes from the sampled soil. When potassium chloride was applied, it tended to increase the toxicity and iodine rate in tomatoes and buckwheat. Although increased iodine uptake was intensified by additional chlorine, the iodine did not affect chlorine uptake at all. Bromine, when applied at a rate of 50 and 100 pounds an acre, had no responses gathered from five New Jersey soil samples.

REFERENCE: Soil Science, Vol. 72, 1952, pp. 127-134.

398. RESPONSE OF SOME COMMON FIELD CROPS TO VARIOUS RATES OF APPLICATION OF CALCIUM ARSENATE TO SEVERAL SOIL TYPES

by

W. B. Rogers

Calcium arsenate was applied to a number of crops on several different soil types to determine the effects it has on plant growth. Vetch, oats, barley, and wheat showed arsenic toxicity symptoms, while soybeans, cotton, corn, and sorghum showed stimulated growth with calcium arsenate applications. Compounds tested to correct excess arsenic concentrations included iron sulfate, managanese sulfate, and dolomitic limestone of which iron sulfate performed the best.

REFERENCE: Proc. Assoc. S. Agric. Workers, Vol. 33, 1932, pp. 30-31.

399. RESPONSE OF SOME DECIDUOUS FRUIT TREES TO ZINC CHELATES

by

N. R. Benson et al.

This report details attempts to correct zinc deficiencies in peach, sweet cherry, and apple trees. Two zinc chelates were added to the soil directly under the trees--Na_2Zn EDTA (disodium zinc ethylenediaminetraacetic acid) and NaZn HEEDTA (sodium zinc hydroxyethylethylenediaminetriacetic acid) were the chelates. Results showed deficiencies were corrected in the peach and sweet cherry trees; greatest zinc uptake was noted in June and again in November; zinc EDTA applied only in the fall did not result in good zinc deficiency correction.

REFERENCE: Soil Science, Vol. 84, 1957, pp. 63-75.

400. ROLE OF CATECHOL AND THE METHYLCATECHOLS AS INDUCERS OF AROMATIC METABOLISM IN PSEUDOMANOS PUTIDA

by

Keith Murray and Peter A. Williams

This report discusses how pseudomonas putida NCIB 10015 produces energy from methylphenols and benzoates. Two processes, which include the meta and ortho pathways, are used to start the reaction. When growth of any catechols took place, then the ortho and meta went into action. This reaction happened in both the phenols and benzoates. Methylcatechols induced growth in the meta pathway. Following this point, any additional growth causes ortho pathways to extend.

REFERENCE: Journal of Bacteriology, Vol. 117, No. 3, March 1974, pp. 1153-1157.

401. SEDIMENT PHOSPHORUS TRANSLOCATION THROUGH ANAEROBIC DISSOLUTION AND GAS-LIFT

by

William B. Woods et al.

Lake water and sediment obtained from Lake Michigan were used in laboratory experiment to study the mobilization of phosphorus. The first section of the study discussed phosphorus movement by anaerobic dissolution. Carbohydrates were fermented by the bacteria moving the phosphorus by means of acid reaction from the sediment into the water. The secondary part of the study assimilated and demonstrated the positive mobilization of phosphorus by the gas-lift phenomena arising from the loss of fermentation gases from the lake sediment.

REFERENCE: Wateruse Proceedings of the 2nd National Conference, 1975, pp. 610-613.

For article on related subject see No. 117.

402. SEPARATION OF DEGREES OF ALUMINUM TOLERANCE IN WHEAT

by

Peter C. Kerridge et al.

A number of varieties of wheat were tested for their tolerance to aluminum. They were placed in three groups according to tolerance levels--tolerant, slightly sensitive, and highly sensitive. The process used for this study is called a nutrient solution culture technique. There are several advantages of this method over the previous used soil method. The nutrient solution method is a quick and reproducible technique. It also is beneficial in that it is nondestructive to plants. Therefore, the same plants may be used for subsequent testing as well as in a breeding program.

REFERENCE: Agronomy Journal, Vol. 62, July-August 1971, pp. 586-591.

403. A SOIL BACTERIUM DECOMPOSING ORGANIC NITRO-COMPOUNDS

by

K. Gundersen and H. L. Jensen

An isolated strain in Corynebacterium simplex soil bacterium was studied by experiments showing its ability to decompose 4,6-dinitro-o-cresol (DNOC). The DNOC acted as an adequate source of carbon and nitrogen, as did several other related organic compounds. The decomposition resulted in the release of nitrite. The potential efficiency of this type of organisms was found to be dependant upon the concentration of herbicide as well as soil pH.

REFERENCE: Acta Agriculturae Scandinavica, Vol. 6, 1956, pp. 100-114.

For article on related subject see No. 119.

404. SOIL FACTORS INFLUENCING THE GROWTH OF COTTON FOLLOWING PEACH ORCHARDS

by

C. R. Lee and N. R. Page

Cotton will not grow normally on soils where peach trees have been removed the previous year unless the trees are burned and the ashes mixed with the soil. The problems result from the presence of fungi, nematodes, decomposing peach roots, and salts of heavy metals. This investigation reveals some soil factors which also contribute to the problem. The peach trees appeared to have been sprayed repeatedly with zinc oxysulfate and sulphur, which lowered the soil pH and increased the zinc concentration to levels that were detrimental to cotton plants. Treating the soil with peach tree ash or lime (calcium carbonate, magnesium carbonate, or sodium carbonate) raised the soil pH to 6.0 or above and decreased the concentrations of zinc and manganese allowing cotton plants to grow normally.

REFERENCE: Agronomy Journal, Vol. 59, May-June 1967, pp. 237-240.

405. SOILS AND THEIR POTENTIAL FOR SAFE RECYCLING OF WASTEWATERS AND SLUDGES

by

Donald E. McCormack

This paper was primarily concerned with using wastewaters and sludge in low concentration as soil amendments. Some of these types of waste can provide significant amounts of nitrogen, phosphorus, organic matter, and a number of other beneficial components necessary for adequate soil properties. Applications of a specific waste to a certain location depends upon a number of factors such as permeability, temperature, and available water capacity, which can be acquired by a complete soil survey.

REFERENCE: Wateruse - Proceedings of the 2nd National Conference, 1975, 629-636.

For article on related subject see No. 206.

406. SOME ASPECTS OF CONTAMINATION OF HERBAGE WITH COPPER, ZINC AND IRON

by

F. Beavington

Australia was the location where samples of white clover and paspalum were selected. The site was near copper and steelwork products. Test results showed a definite level of zinc, copper and iron found in city herbage. The zinc and copper were apparently more from the smelter, whereas, the iron correlated more with the steelworks. A certain amount of all three materials were in the white clover, but not to a large extent in the paspalum.

REFERENCE: Environmental Pollution, Vol. 8, 1975, pp. 65-71.

407. SOME EFFECTS OF SULFUR ON CROPS AND SOILS

by

Henry R. Adams

This paper reports on experiments tested on the use of sulfur as a fertilizer and its effect on the soil. The author tested the influence of sulfur on the germination and early growth of clover and alfalfa and its effect on the acidity and solubility of the soils used.

The effect of leaching on the acidity produced by the sulfur treatment was also tested. From the tests, it was concluded that alfalfa seed will germinate when the intensity of the acidity is too great for growth. There was an increase in soluble salts in the soil, which is probably due to the biological oxidation of sulfur. The test performed for the effect of leaching showed that the sulfate was practically all removed, but the acidity produced by sulfur oxidation was not. Also, leaching made the treated soil slightly more acid. As fast as it was formed, the sulfuric acid reacted with the soil bases, and the increased soil acidity was due to insoluble acids or acid salts. The last leaching from the soil were strongly acid, and the alkaline soil was made more acid by leaching.

The results showed that although there may be little correlation between pH value and total time required to bring one soil to neutrality under other conditions, there is no correlation between these properties in different types of soil.

REFERENCE: Soil Science, Vol. 18, No. 2, 1924, pp. 111-115.

408. SOME FACTORS AFFECTING THE SOLUBILITY OF COBALT

by

Ralph A. Young

This study was designed to determine the effect of hydrogen ion concentration, cations, and ions on the solubility of cobalt. Also studied were the effects of these factors on the extraction of cobalt. Cobalt was found to be very soluble in acid solutions, but would precipitate rapidly when certain pH values were reached. Cations had hardly no effect on cobalt solubility. Concentrations of acids and pH values necessary for the extraction of cobalt were determined although nothing was concluded as to the effects of anions.

REFERENCE: Soil Science Society Proceedings, Vol. 13, 1948, pp. 122-126.

409. SOME RELATIONS OF ARSENIC TO PLANT GROWTH: PART I

by

John Stewart

Experiments found levels of disodium arsenate in small dosages in all the plants tested. In some plants, the arsenate showed not in the foliage, but underground. The most prevalent of plants to show this was the radish. Most analysis determined stimulation to be brought about in low levels of arsenate. In the radish plants, all levels of concentration were evident from the arsenate. The tests indicate all the arsenate that gathers in the soil would be helpful rather than harmful to the plants. This is to say, of course, that the spraying would not be large dosages.

REFERENCE: Soil Science, Vol. 14, No. 2, 1922, pp. 111-126.

410. STABILITY OF NITROSAMINES IN SAMPLES OF LAKE WATER, SOIL, AND SEWAGE

by

Robert L. Tate, III and Martin Alexander

This experiment compared the stability of nitrosamines in three different medians: 1. Williamson silt loam, 2. raw municipal sewage, and 3. Cayuga Lake water. Nitrosamines existing in lake water showed the most resistance to degradation, slow degradation appeared in the soil samples, and a somewhat faster rate occurred in tests involving sewage medians. This suggested the presence of some type of microbial degradation.

REFERENCE: Journal of the National Cancer Institute, Vol. 54, No. 2, February 1975, pp. 327-330.

For article on related subject see No. 122.

411. STUDIES OF FRENCHING OF TOBACCO WITH PARTICULAR REFERENCE TO THALLIUM TOXICITY

by

C. E. Bortner and P. E. Karraker

This study was conducted to determine the effects of thallium treatments on the growth of tobacco plants in water, sand, and soil cultures. Frenching of the plants was not initiated or increased by thallium applications. Thallium induced chlorosis was found. Water cultures required the lowest concentrations for chlorosis development, while no chlorosis symptoms were found in soil culture grown plant until thallium was present in unnaturally high concentrations. Liming and low nutrient content, which affects frenching of plants, caused no noticable affects toward thallium produced chlorosis.

REFERENCE: Journal of American Society of Agronomy, Vol. 32, 1940, pp. 195-203.

412. STUDIES ON THE ANAEROBIC DECOMPOSITION OF PLANT MATERIALS III. COMPARISON OF THE COURSE OF DECOMPOSITION OF RICE STRAW UNDER ANAEROBIC, AEROBIC AND PARTIALLY AEROBIC CONDITIONS

by

Cadambi Narasimah Acharya

Aerobic, water-logged, and anaerobic conditions were used to test the decomposition of rice straw in this study. Collected cellulose appeared the most harmfully affected by the anaerobic process. Aeration brought about much more hydrogen than anaerobic conditions. Carbon dioxide was produced from organic acids and methane during experiments. The order in which the nitrogen factors fell were aerobic, water-logged, and anaerobic. Protein was formed during aerobic conditions and was often insoluble in water.

REFERENCE: The Biochemical Journal, Vol. 29, 1935, pp. 1116-1120.

413. STUDIES ON THE DEGRADATION OF PETROLEUM BY FILAMENTOUS FUNGI

by

J. J. Perry and C. E. Cerniglia

Because of the tremendous demand for petroleum products today, a recurring problem of petroleum pollution exists. The use of a filamentous fungi for the degradation of such incidents as oil spills may be a more efficient alternative. A number of other types of organisms are capable of degrading hydrocarbons, including yeasts and various microbes. Results of this study showed a greater degrading potential by the fungi studied providing the presence of phosphorus and nitrogen sources. An additional advantage was the ability of the fungi to form spores, which can exist dormant during long, harsh conditions, suggesting several beneficial uses.

REFERENCE: The Microbial Degradation of Oil Pollutants, December 1972,
pp. 89-94.

414. STUDIES ON THE EFFECT OF SOIL APPLICATION OF MOLYBDENUM, BORON AND PAPER MILL SLUDGE ON THE POST HARVEST QUALITIES OF POTATO TUBER (SOLANUM TUBEROSUM L.)

by

R. C. Das and M. K. Jena

Soil application of molybdenum, boron, or calcium (paper mill sludge) was shown to produce the following in potato: 1. decreases in specific gravity, 2. increases in the moisture content, 3. increases in the ascorbic acid content, 4. increases in the starch content, 5. a very significant decrease in both percentage of rot per grade and the number of chats (too small for use), and 6. very significant increases in the number of medium and large grade potatoes.

REFERENCE: Madras Agric. Journal, Vol. 60, No. 8, 1973, pp. 1026-1029.

415. STUDIES ON THE POSSIBLE FORMATION OF POLYCHLORAZOBENZENES IN QUINTOZENE TREATED SOIL

by

Hans-Rudolf Buser and Hans-Paul Bosshardt

This article states that polychloroazobenzene was not formed in five soils treated with pentachloronitrobenzene at a level of 1000 parts/10^6 with an incubation of 24 days at 30°C. This supports previous work, which showed that azobenzenes can only be formed from substituted anilines with at least one free ortho position.

REFERENCE: Pesticide Science, Vol. 6, 1975, pp. 35-41.

416. A STUDY OF "CHLOROSIS" IN CORN PLANTS AND OTHER FIELD CROP PLANTS

by

R. M. Barnette and J. P. Camp

The underdevelopment of the chlorosis of corn, known as "white bud", can be linked to the application of zinc sulfate in the drill before planting. Other field crops such as cotton, cowpeas, velvet beans, and Pearl millet have shown symptoms of zinc deficiency. Even though no definite symptoms have been found on peanuts, sugarcane, Napin grass, and crotalaria, these crops have responded to application of zinc sulfate. The Department of Chemistry and Soils has done a cooperative project with this report; further information may be obtained from it.

REFERENCE: Agricultural Experiment Station Annual Report, 1935, p. 45.

417. SULFUR AND TRACE-ELEMENT NUTRITION OF ASPERGILLUS NIGER

by

Robert A. Steinberg

The assimilation of sulfur was tested using a fungus Aspergillus niger. Alkyl sulfonate, alkyl sulfinate, anabolites, homocystine, and methionine were available sulfur supply sources. Sulfide, disulfide, and alkyl mercaptans were not available sources. Factors affecting sulfur assimilation included molecular structure, oxygen presence in the compound, and decomposition of various sulfur compounds into usable forms.

REFERENCE: Journal of Agricultural Research, Vol. 63, No. 2, July 15, 1941, pp. 109-127.

For article on related subject see No. 18.

418. SULFUR-ZINC RELATIONSHIPS IN SOME NEW YORK PEAT SOILS

by

E. V. Staker

Some peat soils in the New York area have been found to contain zinc in amounts dangerous to the growth of vegetable crops. It is now known that a part of the zinc is present as zinc sulfide. In a statistical study from 110 soils, a positive relationship was obtained between the sulfide and total zinc. In another study, the plant growth character under field conditions was compared with zinc and sulfide sulfur contents of the soil upon which the plants were growing. Data was also received showing the relation of sulfur and zinc contents from productive and unproductive peat soils to the amount of zinc found in plants growing on these soils.

REFERENCE: Soil Science Society of America Proceedings, Vol. 8:345, 1943, p. 345.

419. SULFURIC ACID TREATMENT OF CALCAREOUS SOILS: EFFECTS ON PHOSPHORUS SOLUBILITY, INORGANIC PHOSPHORUS FORMS, AND PLANT GROWTH

by

John Ryan and Jack L. Stroehlein

Sulfuric acid was applied to three phosphorus-deficient calcareous Arizona soils--Cave, Latene, and Comoro--in order to reduce their buffering capacities. This application significantly affected both soil pH and the acid titratable basicity of all soils. Of these soils, Cave and Comoro were cropped with tomatoes. The acid treated soil were found to produce higher dry matter yields. Sulfuric acid treatment increased the ammonium chloride, ammonium fluoride, and sodium hydroxide fractions with phosphorus, and also extractable iron, aluminum, and phosphorus levels; and decreased the sulfuric acid-phosphorus fraction. Overall, there was a negative relationship between yield and the sulfuric acid-phosphorus fraction, and a positive relationship with all of the others. This study shows that the application of sulfuric acid on calcareous phosphorus soils can overcome the phosphorus deficiency without the use of commercial fertilizers.

REFERENCE: Soil Science Society America Journal, Vol. 43, 1979, pp. 731-735.

420. TOXIC EFFECTS OF CHROMIUM ON GERMINATING SEEDLINGS AND POTATO TUBER SLICES

by

S. Mukherji and Barun Kumar Roy

The toxic effect $K_2Cr_2O_7$ has on rice seedlings and potato tuber slices was studied. The seedlings of rice were placed in Petri dishes, in the dark, containing $K_2Cr_2O_7$ concentrate. The seedlings were then placed at a constant 30°C for certain amounts of time. Copper reduction was used to measure the amount of sugar and amino acids found by colorimetric ninhydrin method. Potato tubers were tested and treated for openness by dipping into concentrations of $K_2Cr_2O_7$. The filters were examined for sugar by the method of colorimetrics. At the former concentration, chromium did not stop growth of the plant. It retarded the elongation period rather than growth of the root. Chromium found in potato discs did affect the changes of the openness in the discs when chromium was applied. The concentration not only depressed the water level, but damaged the wholeness of the membrane.

REFERENCE: Biochem. Physiol. Pflanzen, Vol. 171, 1977, pp. 235-238.

421. TOXICITY AND ACCUMULATION OF CHLORIDE AND SULFATE SALTS IN PLANTS

by

Frank M. Eaton

A series of crop plants were grown in soil cultures and then applied with various chloride and sulfate salts. Chlorides were found to be twice as toxic as sulfates in many cases, but some results varied widely. Chloride salts also increased the hydrogen-ion concentration where sulfates did not. Results showed a higher degree of toxicity per unit of salt low concentrations than in higher ones. The application of salts caused such symptoms as reduction in leaf size, blossom-end rot, leaf burns, and growth depression curves. The water requirements of plants growing on saline soils were also found to be lower than control plants. The absolute tolerance of any plant appeared to be a vague concept in that a wide range of concentrations will prove fatal to plants over an extended period of time.

REFERENCE: Journal of Agricultural Research, Vol. 64, April 1, 1942, pp. 357-399.

422. TOXICITY FROM ARSENIC COMPOUNDS TO RICE ON FLOODED SOILS

by

J. Felding Reed and M. B. Strugis

This report documents arsenical activity of arsenic dusted cotton sites that have consecutively been changed over to rice production, hence being subject to flooding. Water-soluble arsenic didn't show toxicity, but 0.05 nitrogen hydrochloric acid-soluble arsenic showed some toxicity. Also, related arsenic compounds in the soil were very toxic to rice during these flood conditions.

REFERENCE: Journal of the American Society of Agronomy, Vol. 28, 1936, pp. 432-436.

423. TRACE-ELEMENT TOXICITIES IN OAT PLANTS

by

James C. Hunter and Ornella Vergnano

Crops grown on a certain igneous glacial drift soil were noted to contain excessive concentrations of nickel along with other trace elements. An investigation was conducted to determine the effects of nickel, cobalt, chromium, copper, zinc, manganese, molybdenum and aluminum on oat plants. Toxicity to the plants from these minerals occurred in the forms of chlorosis, necosis, increase in phosphate, nitrogen deficiency, and irregular plant growth and structure, depending upon the mineral type and concentration. The results of this investigation are illustrated in detailed tables.

REFERENCE: Anal. Appl. Biology, Vol. 40, 1953, pp. 761-777.

424. TRACE ELEMENTS IN CORN GROWN IN LONG-TERM SLUDGE DISPOSAL SITE

by

M. B. Kirkham

Soil treated with municipal sludge for a period of 35 years was tested along with the corn plants for evidence of aluminum, cadmium, copper, iron, manganese, nickel, lead, and zinc. There was evidence of trace elements in a concentration from 0 to 30 cm. Although these test results showed large amounts of trace elements in the soil, it was not necessarily found in the corn plants, However, the roots did have amounts of the elements to quite a large degree. Of all the elements, cadmium and copper were highest in concentration in the leaves.

REFERENCE: Environment Science Technology, Vol. 9, No. 8, August 1975, pp. 765-768.

425. TRACE METALS IN SOILS, PLANTS, AND ANIMALS

by

Donald J. Lisk

Extensive research has been done concerning the presence and relationships of essential metals in soils and the mobility, reactions, and effects in biological systems of these metals. This is discussed at great length and detail in two major sections consisting of four heading and two heading respectively. The first section deals with the soil-plant complex. Detailed discussions in this section are sources of metals in soils; associations and behavior of metals in soil; the plant factor; and specific metals. The second section deals with aquatic systems; water and aquatic organisms are dealt with in this section. An overview of continuing research finalizes this article. The abatement of pollutants and the recycling of products will provide the solutions of the protection of our delicate environment.

Five tables aid in illustrating the main points concerning trace metals in this article.

REFERENCE: Advanced Agronomy, Vol. 24, 1972, pp. 267-325.

426. UNPRODUCTIVENESS OF CERTAIN ORCHARD SOILS AS RELATED TO LEAD ARSENATE SPRAY ACCUMULATIONS

by

S. C. Vandecaveye et al.

An investigation was done over soil samples taken from the Yakima Valley area. Soil was taken at depths of 6 inches, which contained between 4.5 and 12.5 ppm of soluble arsenic. Soils that were untreated were analysed in a laboratory using barley and alfalfa plants. The results were identical when the arsenic treated soils and untreated soils were compared. The effect of the arsenic showed a reduction of growth in the apple trees on site and laboratory tests of plants when potted in soil from the valley location. A decrease in growth was present, but no toxic effects were a result of soils receiving more than 50 ppm of lead nitrate.

REFERENCE: Soil Science, Vol. 42, May 25, 1936, pp. 203-215.

427. THE UPTAKE AND ASSIMILATION OF SELENITE BY HIGHER PLANTS

by

P. J. Peterson and G. W. Butler

Various plants such as wheat, red and white clover, and ryegrass were tried in nutrient solutions including selenium-selenite ions. To understand the absorption of selenium, the roots and shoot tissues were fractioned. In general, the uptake was similar among all 5 plants for a 10 day span. The Neptunia had the highest level of ethanol-soluble. In ethanol extracts, the selenite was most frequent in wheat. Pasture species were found to correlate with sulphur-containing metabolites. Large incorporations of selenium within the seleno-amino acids were observed in red and white clover, ryegrass and wheat. Found in Neptunia, was a decreased amount of protein incorporated in the selenium.

REFERENCE: Aust. Journal of Biological Science, Vol. 15, 1962, pp. 126-146.

428. UPTAKE AND METABOLISM OF INORGANIC FORMS OF SELENIUM-75 BY SPIRODELA OLIGORRHIZA

by

G. W. Butler and P. J. Peterson

Selenium-75 as selenite, selenate or colloidal selenium were in the sterile nutrient cultures of duckweed (S. Oligorrhiza). Absorption and assimilation of selenium by the plant was measured. Selenite was shown to absorb and assimilate three times faster than selenate. Colloidal selenium was metabolized very well also. The main path of assimilation was selenomethionine in proteins.

REFERENCE: Aust. Journal of Biological Science, 1967, pp. 77-86.

429. UPTAKE BY PERENNIAL RYEGRASS OF IODIDE, ELEMENTAL IODINE AND IODATE ADDED TO SOIL AS INFLUENCED BY VARIOUS AMENDMENTS

by

David C. Whitehead

Analysis of perennial ryegrass was observed when three substances were applied. Iodide, elemental iodine and iodate were the three applied at a rate of 20 mg I/kg. One or the other element would cause an increase in uptake, while another might cause uptake to decrease. In one test, farm manure decreased the uptake of all iodines by ten times. Iodine appeared most prevalent in uptake increasing when compared to the other iodines. Rates of recovery in the ryegrass ranged from 0.03% elemental iodine mixed with soil plus FYM to 2.16% iodate combined with soil and chalk.

REFERENCE: Journal Sci. Fd. Agric., Vol. 26, 1975, pp. 361-367.

430. UPTAKE OF A PCB (AROCLOR 1254) FROM SOIL BY CARROTS UNDER FIELD CONDITIONS

by

Yutaka Iwata et al.

Carrot plants were used to study the translocation of polychlorinated biphenyls (PCBs) in the soil. Higher degrees of translocation were associated with lower biphenyls chlorination. Most of the uptake by carrot plants occurred in the peel with little adsorption taking place in the plant tissue.

REFERENCE: Bulletin Environmental Contamination, Vol. 11, 1974, pp. 523-528.

431. UPTAKE OF Ra^{226} BY PLANTS AND CHANGE IN ITS STATE IN THE SOIL--PLANT TOPS--LITTERFALL SYSTEM

by

A. I. Taskeyev et al.

$Radium^{226}$, located in Sod-Meadow soil, was found to be controlled more readily by barium than calcium. There was a straight connection between $Radium^{226}$ and barium. No correlation was found between barium and calcium or calcium and $Radium^{226}$. $Radium^{226}$ is in a mobile form within the Sod-Meadow soil in a formation of acid-solubles, exchangeables, and water solubles. Plant tops can form compounds with $Radium^{226}$ in a low chemical mobility. Exchangeable $Radium^{226}$ made soils as well as water-soluble forms exceed formation. By drying process, plants increased in mobility of $Radium^{226}$ and formed stronger $Radium^{226}$ bonds. The ratio between live plants and litterfall depends upon the biochemical plant characteristics.

REFERENCE: Soviet Soil Science, Vol. 9, 1977, pp. 79-85.

432. USE OF WASTE MATERIALS FOR REVEGETATION OF CHROMATE SMELTER WASTE

by

R. P. Gemmell

This paper looks at a study of the chromate smelting and on the correction of substrate toxicity in residues from the industry. The investigations into techniques of revegetation of the waste were promoted by the Lancashire County Council to reclaim one derelict site of Britain's three principal smelters; two have already halted productions. The main conclusions of this project are that waste can be revegetated for amenity grassland by treatment with two other wastes.

REFERENCE: Nature, Vol. 240, December 29, 1972, pp. 569-570.

For articles on related subject see Nos. 130, 131, and 132.

433. VARIETAL RESPONSE TO LEAD BY LETTUCE

by

Matt K. John

Lettuce varieties of nine categories were grown in water nutrient solution at six substrates of lead concentrations to 50 ppm in the substance acted upon by enzymes. Lead concentration in the top and root tissue along with the amounts absorbed and transmitted into edible tissues were dependent on exposure duration and variety of substrate lead. Lettuce plants did absorb and translocate lead, while lead substrate was in condensed form. Responses were different among the variety of similar shapes showing an adjusted physiological mechanisms of lead condensation and translocation. Varietal selection could reduce human and animal food intake of lead. In early growth stages, varieties revealed some stimulation with low levels of lead and suppressed growth with high levels of lead. Genetic variation also comprised non-significant response of growth.

REFERENCE: Water, Air and Soil Pollution, Vol. 8, 1977, pp. 133-144.

For article on related subject see No. 133.

434. YIELD AND METAL COMPOSITION OF CORN AND RYE GROWN ON SEWAGE SLUDGE-AMENDED SOIL

by

J. D. Cunningham et al.

Sludge was selected for detrimental effects from four municipalities located in Wisconsin. The sludge was analyzed for extremely high concentrations of chromium, zinc, copper, or nickel. After leaching the soil, three crops were grown on the sludge-revised soil. High limed sludge increased pH level to 7.4. Other effects involved with high rates of sludge were lowered pH, and soluble salts reached valid concentration with higher rates of sludge. Nitrogen, phosphorus, and polonium added positive responses when added to sludge. Most yields of crops decreased except when exposed to high rates of sludge. The significant difference between sludges was the tissue metal concentration. The phytotoxic concentrations of copper occurred more often on a regular basis. Tissue concentrations ranged from 0.4 to 1.7 on the average. The sewage sludge values were from 5-16 among the chemicals.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 4, 1975, pp. 448-454.

435. ZINC DEFICIENCY IN FLAX

by

C. R. Millikan

This paper discusses zinc deficiency and its symptoms in flax plants. The time of year when flax crops were planted was found to have a direct relationship with the incidence of zinc deficiency symptoms. Deficiency was also found more often in black alkaline soils. Symptoms appearing several weeks after germination include "bronzing", "resetting", and "die back" conditions. In some cases, afflicted plants will recover by secondary growth, while other tests where zinc deficiency was maintained resulted in no recovery. Finally, zinc sulfate applications to the soil were shown to be a remedy to the problem.

REFERENCE: The Journal of Agriculture, Vol. 44, February 1946, pp. 69-73 and 88.

For article on related subject see No. 201.

436. GROUNDWATER CONTAMINANTS FROM LAND DISPOSAL OF RESIDUES: A SURVEY IN THE PROVINCE OF ANTWERP, BELGIUM

by

J. Verheyden and P. Voets

This research studied groundwater contamination from land disposal of industrial residues. Leachates in the disposal areas were tested for chemical characterisitcs. A multi-element screening was then done to determine composition of waste materials. Although no detrimental effects were found, future damage is possible. To solve this problem it was suggested the percolates in dump site be strictly controlled and that "black" leachages be adequately aerated before being discharged.

REFERENCE: Water Science Technology, Vol. 13, 1981, pp. 1125-1134.

437. GROUND-WATER CONTAMINATION BY FERTILIZER NITROGEN

by

Harold R. Duke et al.

This study analyzed the leaching of fertilizer nitrogen by excessive spray irrigation water. Emphasis was made on nitrate-nitrogen, which may reach the water table. Total nitrate loss was directly related to the actual amount of deep percolating water. Concentrations and percolation rates of nitrate are also affected by time and soil variability. No quantitative results were secured on nitrates present in return flows; however, if any significant denitrification occurs, potential pollution by nitrates is reduced. The most effective means of controlling this leaching known is by careful irrigation water management.

REFERENCE: Journal of the Irrigation and Drainage Division, September 1978, pp. 283-291.

For article on related subject see No. 153.

438. INFLUENCE OF ENVIRONMENTAL FACTORS ON THE NITROGEN CYCLE IN WATER

by

Jack DeMarco et al.

This experiment studied the effects of environmental factors on the nitrification cycle in water. Also mentioned was ammonia oxidation. Turbulence and an increase in initial nitrifying seed concentration were the factors found to increase the initial rate of ammonia oxidation. Ammonia nitrogen oxidation was decreased in the presence of nitrites, while nitrates had no significant effect. The presence of organic materials showed varied effects depending on the ammonia nitrogen's assimilation state. An attempt was made to use bacterial counts to evaluate nitrification potential, which was unsuccessful because of its inefficiency and the time needed to count the nitrifying population.

REFERENCE: Journal AWWA, May 1967, pp. 598-592.

439. SIMPLIFIED METHOD OF PREDICTING FALL OF WATER TABLE IN DRAINED LAND

by

Herman Bouwer and Jan van Schilfgaarde

Using the steady-state theory and abrupt drainage of pore space, this method is a good, simple, accurate formula for simple drainage design. However, it is not as accurate as some other formulas. This procedure is for predicting rate fall of the water table in ditch-drained and/or tile-drained land.

REFERENCE: Transactions of the ASAE, 1963, pp. 288-291 and 296.

For articles on related subject see Nos. 3, 110, and 116.

440. TRANSIENT DESIGN OF DRAINAGE SYSTEMS

by

Jan van Schilfgaarde

Several previously used analysis for transient water tables were reviewed along with a new type of approach that includes precipitation in the calculations. The analysis studied showed accurate formulations as checked against field data for the design of drainage systems. One desirable method is the use of frequency distribution of water table height in conjunction with recurrence intervals. The results of this analysis show the feasibility of the approach.

REFERENCE: Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, September 1965, pp. 9-22.

441. WATER QUALITY CRITERIA: 1972 NATIONAL ACADEMY OF SCIENCES-NATIONAL ACADEMY OF ENGINEERING

This is an update of the 1968 W. Q. C. Many new areas are discussed--the recreational impact of boating, levels of use, disease, vectors, nuisance organisms, aquatic vascular plants, viruses in relation to public water, effect of dissolved gases on aquatic life, toxilogical research guidelines, solid waste disposed in oceans, irrigation, and industrial waste water treatments. Also, several potentially toxic substances not discussed in the 1968 report are considered.

REFERENCE: NTIS, PB 236 199 (EPA), March 1973.

442. PLANNING FOR LAND-BASED WASTE MANAGEMENT SYSTEMS: SOME ECONOMIC AND INSTITUTIONAL CONSIDERATIONS

by

Maurice Baker and Lee A. Christensen

The use of air and water for disposal of wastes from production and consumption is no longer acceptable. One of the alternative means of disposal is land disposal. Decisions concerning utilization and disposition of residual wastes is influenced by a large number of variables.

This article discusses the economics related to waste management in terms of costs analyses, externalities, government actions, materials flow, joint products, and stock and flow resources. Means for attaining environmental goals are by a legal-regulatory approach and an economic incentive approach. Opportunity costs will influence whether a residual will be used in a production process. Some objectives of land application are minimizing waste treatment costs, disposing of wastes in an environmentally acceptable manner supplying nutrient or water requirements of crops and recharging ground aquifers. Some options for institutional structures discussed are acquisition and management options; fee simple acquisition; less than fee simple and contractual agreements. There is a long discussion of a decision framework for considering land application, and a discussion of cost of land application systems.

REFERENCE: Land Application of Waste Materials, Soil Cons. Society of America, pp. 278-288.

For articles on related subject see Nos. 17 and 198.

443. AGRICULTURALLY RELATED PRETREATMENT LAND APPLICATION SYSTEMS

by

M. R. Overcash and F. J. Humenik

Animal production industry wastes and some agricultural processing wastes can be treated by land application with nitrogen being the only component that dictates treatment characteristics. Aerated lagoons, unaerated lagoons, recycling overland flow, and sprinkler application are all known as good treatment methods for denitrification of the above waste types.

REFERENCE: Proceedings of the 2nd National Wateruse Conference, 1975, pp. 688-692.

444. BENCH-SCALE TESTING FOR RESIDUAL WASTE TREATMENT

by

J. Vuceta et al.

This project was primarily concerned with demonstrating the most effective technology for treating various industrial residual wastes. One of the methods investigated, foam fractionation, was found to be an undesirable treatment because of its ineffectiveness and its harmful by-products. Batch process treatment technology was shown to be the most desirable method. This is due to the diversity of processes needed to treat different types of wastes. An extensive sequence of steps was then established for the proper treatment of these substances.

REFERENCE: Journal WPCF, Vol. 51, October 1979, pp. 2366-2383.

For article on related subject see No. 44.

445. EFFECTS OF GAMMA RADIATION ON AQUEOUS SOLUTIONS ON PHENOL

by

Loran M. Coffman and David D. Woodbridge

This experiment investigated the use of radiation for the treatment of various phenol solutions. Tests of various doses of gamma radiation from a cobalt-60 source showed a significant destruction of the phenol structure. This is a promising sign as the destruction by this means can alter the structure of phenol compounds to more readily degradable forms.

REFERENCE: Bulletin Environmental Contamination Toxicology, Vol. 11, No. 5, 1974, pp. 461-466.

446. FULL-SCALE DEMONSTRATION OF INDUSTRIAL WASTEWATER TREATMENT UTILIZING DU PONT'S PACT PROCESS

by

Harry W. Heath, Jr.

Using this method, highly acidic wastewater from the Chamber Works in New Jersey was treated with higher than normal bacteriological degradation due to the introduction of activated carbon in effluent aeration. This synergistic relationship gives reductions in biochemical oxygen demand and dissolved organic carbon and coloring. It is suggested that carbon regeneration furnaces be better designed to increase recyclable carbon removal.

REFERENCE: EPA Project Summary, EPA 600/S2-81-159, December 1981, pp. 1-9.

For article on related subject see No. 71.

447. A MODEL FOR THE ANALYSIS OF SEASONAL ASPECTS OF WATER QUALITY CONTROL

by

Don Yaron

This paper presents a model for the analysis of seasonal aspects of water quality control. The model includes interseasonal variation of flow intensity and the river's pollutant assimilation capacity. The paper gives several application possibilities of the model and applies it to an actual industrial situation. Results showed that seasonal adjustments made possible by this model would be a considerable economical advantage to the treatment plant discussed.

REFERENCE: Journal Environment Econ. and Management, Vol. 6, 1979, pp. 140-151.

For articles on related subject see Nos. 3, 73, and 82.

448. PHOTO FIRM ACHIEVES ZERO WASTE DISCHARGE

A large photographic firm has been able to reduce their waste discharge to zero. Their recycling process is in four phases. With this system the firm is able to recover $700,000 worth of photographic silver a year, $300,000 a year in chemical costs have been saved, and enough ammonia is recovered to fertilize the lawn at the 57 acre site. The techniques used in the system are reverse osmosis, electrolysis, ion exchange, and evaporation.

REFERENCE: Chem. and Eng. News, Vol. 56, 1978, p. 19.

For article on related subject see No. 376.

449. PHYSICAL, CHEMICAL, BIOLOGICAL TREATMENT TECHNOLOGIES FOR INDUSTRIAL WASTEWATER (VOL. II)

by

Arthor D. Little, Inc.

Forty-seven unit engineering processes were examined as to their use for treating hazardous industrial waste. Some of these processes are in use now; some need further research and development before their use will be economically attractive to industry. Of the processes, dialysis, electrophoresis, freeze drying and zone refining were found to be of no value in hazardous waste treatment. Part two is the comprehensive descriptions of each unit process. (NOTE: This is Volume 2 of a two volume report.)

REFERENCE: PB-257-287, 1976, pp. 1-516.

450. THE PULP AND PAPER INDUSTRY'S DRIVE TOWARD INNOVATIVE POLLUTION CONTROL

by

Swep Davis

This report discusses a pilot plant using ultrafiltration (UF) and reverse osmosis (RO) as a method of pollution control primarily for the pulp and paper industry. The report presents approximate costs and effectiveness of the operation. Other forms of treatment discussed include aerated lagoons, air-activated sludge systems and alum treatment.

REFERENCE: Environmental Science and Technology, Vol. 12, June 1978, pp. 629-630.

For article on related subject see No. 111.

451. RAPID-INFLITRATION DISPOSAL OF KRAFT MILL EFFLUENT

by

A. T. Wallace et al.

After having difficulty with their existing biological stabilization method, a lagoon system, Hoerner Waldore began studies investigating the use of rapid infiltration to increase the average infiltration rate above that of continuous dosing, used that data to achieve high quality percolate. All data from the field tests are included in the report as well as financial considerations involved in a system change-over.

REFERENCE: 30th Industrial Waste Conference, Purdue University, 1975, pp. 506-516.

452. THE SECOND STAGE TREATMENT OF BIOLOGICALLY TREATED COAL CARBONISING WASTES IN ADMIXTURE WITH SEWAGE

by

Henry B. Tench

Coal carbonising wastes that are biologically treated can be evaluated for treatment by discharging them into the sewer. Here a treatment with admixture of sewage is mixed. Twenty percent of the mixture is treated, and nitrification can be present with a proper buffer to neutralise the acid formation. Some of the effluents were coloured brown from chemicals processed having phenols and chlorophenols. Ferrous or ferric hydroxide were found to be a source of removal by surface adsorption by adding salts or neutralisers to aeration tanks of sludge plants. There is a certain discharge procedure which will have a satisfactory condition present. This is a form of even handedness, which can be done in a number of practical ways.

REFERENCE: Progressive Water Technology, Vol. 12, 1980, pp. 224-230.

453. SELECTED BIODEGRADATION TECHNIQUES FOR TREATMENT AND/OR ULTIMATE DISPOSAL OF ORGANIC MATERIALS

by

S.C.S. Engineering

Treatment techniques using activated sludge, series lagoons, deep shaft aeration, and pure oxygen biological systems were compared to evaluate their usefulness in treating difficult waste problems. These problems were high chemical oxygen demand-biological oxygen demand ratios, low nutrient content, biocidal content, only marginally degradable constituents and and high shock loading tendency. The best techniques were those that exhibited the highest values in good treatment results over the broadest range of waste classes, and also, those which showed to enhance treatment qualities.

REFERENCE: EPA-600/2-79-006, 1979, pp. 1-379.

454. SPECIFIC CHARACTER OF BORON ADSORPTION BY AN AMORPHOUS SOIL

by

Frank T. Bingham and A. L. Page

Boron adsorption characteristics of amorphous soils were studied. Maximum values for B adsorption occur under alkaline conditions. It appears that sites which absorb B are more or less specific and are independent of other inorganic anions.

REFERENCE: Soil Science Society American Proceedings, Vol. 35, 1971, pp. 892-893.

455. TERTIARY TREATMENT OF EFFLUENT FROM SMALL SEWAGE WORKS

by

R. G. Walker et al.

This report compared three different tertiary treatment methods by studying records of an operating waste treatment facility. Grass plot irrigation, slow sand filters, and upward-flow clarifiers were the methods compared for both effectiveness and costs. All methods significantly improve humus-tank effluent. Upward-flow clarifiers were the least effective with grass plots eliminating the most BOD. Slow sand filters more completely reduced suspended solids. Charts of comparative costs are also given showing initial cost, operational costs, etc.

REFERENCE: Water Pollution Control, 1972, pp. 198-201.

456. TREATMENT COMPATIBILITY OF MUNICIPAL WASTE AND BIOLOGICALLY HAZARDOUS INDUSTRIAL COMPOUNDS

by

A. F. Gaudy et al.

This study looked at ways to receive additional information on the effects of several compounds and to find out the most useful study methods to be used in measuring effects similar to the need for pretreatment of industrial wastes. In batch pilot plants, 24 compounds were studied; 8 of these were studied in continuous flow pilot plants operated at a sludge age of 5 days. Four of the 8 were studied in extended aeration pilot plants. The compounds were each studied for a period of 6 months under each area of operation. Of the 24 compounds studied, only pentachlorophenol and 2-chlorophenol gave evidence of causing metabolic stress to the system at 5 mg/l of feed concentration. In the study of extended aeration systems, there was only evidence for increased soluble COD in the effluent only from the unit dosed with phenol at the 5 mg/l dosage level. From this study it was evident that effluents of the extended aeration pilot plant were lower in soluble COD and in suspended solids concentrations. In designing a study procedure to find the effects of priority pollutants on activated sludges, the ecological considerations as in effluent clarity and also other aspects of ecology should be included as parameters for assessment.

REFERENCE: EPA, November 1983, pp. 1-3.

For article on related subject see No. 135.

457. ACTIVATED SLUDGE PRIMARY BIODEGRADATION OF POLYCHLORINATED BIPHENYLS

by

E. Scott Tucker et al.

Highly chlorinated polychlorinated biphenyl (PCB) residues have been found in the environment suggesting that they may be resistant to microbial degradation. This study was instituted to determine if PCBs were degradable by activated sludge. The study showed that the lower chlorinated biphenyls, such as mono- and dichlorobiphenyl, were readily degraded by the sludge. This is reinforced by the fact that lower chlorinated materials are not found as residues even in uncontrolled areas because they degrade rapidly enough not to become accumulated. On the contrary, the data also showed that as higher levels of chlorination, such as tri-, tetra-, and pentachlorophenyls occur, degradation rates decrease. This explains why residues in biological and environmental samples were of higher chlorination levels.

REFERENCE: Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 6, 1975, pp. 705-713.

For article on related subject see No. 215.

458. ADSORPTION AND MOVEMENT OF SELECTED PESTICIDES AT HIGH CONCENTRATIONS IN SOILS

by

P. S. C. Rao and J. M. Davidson

Webster, Cecil and Eustis soils were measured for adsorption of three different pesticides. The following pesticides are 2,4-D amine, atrozine, terbacil and methyl parathion. These pesticides were measured at their solution concentration ranging from zero to the aqueous soluble limit of pesticide present. Of the four soils adsorption measured, the isotherms soil-pesticide combined were nonlinear freundlich type. Freundlich adsorption, potassium, based on soil mass. Soil columns were measured for the influence the shape would have on the adsorption isotherm movement of 2,4-D amine and atrazine. These were tested through water-saturated columns at two imput solution concentrations. From 50 and 5,000 $\mu g\ ml^{-1}$ for 2,4-D amine, to 5 to 50 $\mu g\ ml^{-1}$ for atrazine. In higher concentrations, the pesticide mobility was of greater significance. Therefore, it may be the beginning of errors when pesticide transports are moved from waste disposal at high concentration.

REFERENCE: Water Research, Vol. 13, 1979, pp. 375-380.

For article on related subject see No. 19.

459. ADSORPTION-DESORPTION OF SELECTED PESTICIDES BY ORGANIC MATTER AND MONTMORILLONITE

by

Richard D. Carringer et al.

This experiment used deionized water, 1N calcium chloride, organic matter and calcium-saturated montmorillonite to determine the adsorption and desorption of a number of various types of pesticides. Results indicated the adsorption of all pesticides except dicamba. For identification purposes, the pesticides were divided into four groups: acidic, basic, miccellaneous nonionic and dinitroaniline. Basic herbicides were the most significantly absorbed by the montmorillonite. Dicamba was adsorbed to some extent by the clay. The remaining herbicides displayed little or no adsorption by the montmorillonite clay. The study concluded that the organic matter content of the soil was the primary factor for determining adsorption with clay content being useful when discamba and prometryn herbicides are present.

REFERENCE: Journal Agric. Food Chimistry, Vol. 23, No. 3, 1975, pp. 568-572.

460. ADSORPTION OF PHOSPHORUS BY FOUR SASKATCHEWAN SOILS

by

D. A. Rennie and R. B. McKercher

This report discussed the difference in phosphorus adsorption by soils with varied colloid content. The equilibrium phosphorus concentration was closely related to the percent of phosphorus saturation occurring. Amounts of phosphorus adsorbed varied in relation to colloid content of each soil. Organic matter was also found to be an important factor for predicting phosphorus adsorption capacity.

REFERENCE: Canadian Journal of Soil Science, Vol. 39, February 1959, pp. 64-75.

For articles on related subject see Nos. 20, 21, 22, and 43.

461. ADSORPTION OF SOME MONOHYDROXYBENZENE DERIVATIVES BY SOILS

by

Juan Artiola-Fortuny and Wallace H. Fuller

Field and laboratory tests were conducted to determine the adsorption rate and factors influencing adsorption of phenols by the soil. In mineral soils, the primary factors involved are pH and iron oxide percentage with moderate pH level and a high buffering capacity supplementing adsorption rates. Two constants used agreed closely to actual behavior of the substance in the soil. One of the constants showed the hydrophobic phenols are more readily adsorbed in saturated soils than are the hydrophilic type.

REFERENCE: Soil Science, Vol. 133, No. 1, January 1982, pp. 18-26.

462. ARSENIC SORPTION BY SOILS

by

L. W. Jacobs et al.

Preservation of arsenic increased as the sesquioxide capacity increased with equilibrated arsenic. Iron and aluminum forms were removed by treatments using oxalate elimination. The arsenic sorption level in the soil was greatly reduced in relation to the treatments. Formed iron and aluminum components that sorbed additional arsenic removed arsenic quantity from soils by extractional oxalate and recovery of arsenic added NH_4F- arsenic will be underestimated unless a correction of resorption is made with sorption by soil components during extraction.

REFERENCE: Soil Science Society of America Proceedings, Vol. 34, 1970, pp. 750-754.

463. ATTENUATION OF POLLUTANTS IN MUNICIPAL LANDFILL LEACHATE BY CLAY MINERALS

by

R. A. Griffin and N. F. Shimp

Part one of this report is based on data from laboratory column studies of municipal solid waste landfill leachate--attenuation of pollutants in the leachate by sand and calcium saturated clays. The most outstanding fact generated by this study is that lead, cadmium, mercury, and zinc were strongly attenuated even when only small amounts of clays were present. The clays in ascending order of attenuation capacity are montmorillonite, illite, and kaolinite.

Part two is data from batch studies of the adsorption of chromium, cadmium, arsenic, selenium, copper, lead, mercury, and zinc by montmorillonite, and kaolinite in solution and leachate. (pH) was shown to have primary effect on adsorption. It is cautioned, however, that predicted adsorption of an element can't be transferred to a different leachate.

REFERENCE: EPA-600/2-78-157, PB 287-140, 1978, pp. 1-159.

464. BEHAVIOR OF CHROMIUM IN SOILS: III. OXIDATION

by

Richmond Bartlett and Bruce James

Chromium that is reduced is considered to be a stable form in soils. When trivalent chromium was mixed with a hexavalent, it mixed coherently well in many of the prevalent field soils. Manganese that is oxidized serves as the electron acceptor during the reaction period. To test soil for its ability to oxidize chromium, one can either measure the manganese lowered by hydroquinone or by adding chromium III directly to moistened soil. It was later discovered that the plants gave a more positive sample if they were tested in moist soils with hexavalent chromium remaining present after 5 months at 25°C. Chromium (VI) was damaging to the plants when taken from the form chromium (III).

REFERENCE: Journal of Environmental Quality, Vol. 8, No. 1, 1979, pp. 31-34.

For articles on related subject see Nos. 12 and 225.

465. BEHAVIOUR OF HEAVY METALS IN SOILS

by

K. Harmsen

An investigation was conducted to determine the content of zinc, cadmium, copper, lead, iron, and manganese in a salt solution and a dilute acid in soils high in heavy metals, and to analyze the function that iron and manganese oxide plays in binding other heavy metals. Exchange adsorption of ions in soil and the role of hydrolysis was determined. Heavy metals were found to be subject to regular and selective exchange adsorption and superequivalent adsorption. The results of this study may be valuable for environmental control of heavy metals.

REFERENCE: Agric. Res. Rep., Vol. 866, 1977, p. 171.

466. A COMPARATIVE ELECTRON SPIN RESONANCE STUDY OF VO^{2+} COMPLEXATION IN SYNTHETIC MOLECULES AND SOIL ORGANICS

by

M. B. McBride

Recent work in the area of metal bonding on soil organics, through use of electron spin resonance, has revealed the VO^{2+} (Vanadyl ion) to be of great value in providing ligand type, degree of covalency of the metal-organic complex, and stereochemical information. Comparisons between synthetic and natural organics were undertaken with respect to the electron spin resonance feature of the vanadyl ion (VO^{2+}), to reveal the physicochemistry of complexing sites in soil organics. All results are recorded therein.

REFERENCE: Soil Science Society of America Journal, Vol. 44, 1980, pp. 495-499.

For articles on related subject see Nos. 52, 141, 231, 234, 235, 238, 242, and 244.

467. CONTRIBUTION OF THE SOIL TO THE MIGRATION OF CERTAIN COMMON AND TRACE ELEMENTS

by

W. H. Fuller et al.

Information on the immobilization of health hazard trace elements is limited in order to prevent migration through soil. Information is scant to prevent movement from domestic waters into potential food channels concerning trace element stabilization. This research has provided basic information as a starting place to control hazardous migration through soils. Eleven soils from the United States were contributed to mobility of common trace elements. These were affected by four characteristics--pure water, dilute acid, solutions like industrial wastes, municipal landfill leachates. From the data, much was learned in order to work with each characteristic. Soils migrate at different rates relying much on some indigenous parameters. A continual process of soils is solubilizing and mobility. Interesting enough, data showed even the cleanest aqueous vehicle can be a carrier of potentially hazardous trace elements. In conclusion, every soil characteristic should be identified for control of hazardous constituents in waste disposal.

REFERENCE: Soil Science, Vol. 122, No. 4, 1976, pp. 223-235.

For articles on related subject see Nos. 251, 254, and 255.

468. DECOMPOSABILITY OF SOME ORGANIC SULFUR COMPOUNDS IN SOIL

by

Lloyd R. Frederick et al.

Numerous sulfur compounds were tested with aerobic conditions in different levels of soil. Various compounds were used in the experiment with results being different at each level of soil. Decomposition had characteristics of being nonbiological or of methionine. Certain concentrations, such as 1% or more in sulfate soil, caused toxicity in thiourea, phenyl thiourea, and mercaptoethanol. Some decomposition procedures caused an increase in acid. This was brought about by sulfate and nitrate that formed in the soil. Under methionine conditions alkaline and then acid formed.

REFERENCE: Soil Science Society Proceedings, 1957, pp. 287-292.

For articles on related subject see Nos. 55 and 260.

469. DECOMPOSITION OF SPECIFICALLY CARBON-14 LABELED BENZOIC AND CINNAMIC ACID DERIVATIVES IN SOIL

by

K. Haider and J. P. Martin

This experiment studied the decomposition of benzoic, phenolcarboxylic and cinnamic acid by tracing carbon labeled samples in a neutral soil. Through a twelve week incubation period, phenolic compounds were readily degraded. During the same time, a maximum of 85% of the benzoic, cinnamic and related acids were either lost or partially broken down into carbon dioxide. Applications of peach wood or humic acid had little effect on decomposition of phenols, while linkage into model phenolase polymers significantly altered decomposition.

REFERENCE: Soil Science Society of America, Vol. 39, No. 4, 1975, pp. 657-662.

470. DEGRADATION OF POLYCHLORINATED BIPHENYLS BY MIXED MICROBIAL CULTURES

by

R. R. Clark et al.

Organisms found common to three soil cultures were responsible for degrading polychlorinated biphenols--Alcaligenes odorans, Alcaligenes denitrificans and an unidentified bacterium. The isomers of polychlorinated biphenyls that were more water soluble and had a higher chlorination were completely utilized by the cultures. The polychlorinated biphenyls residues were mainly made up of higher chlorinated isomers. In the presence of acetate as the cosubstrate, a form of cometabolism of polychlorinated biphenyls was also found with the cultures.

REFERENCE: Applied and Environmental Microbiology, Vol. 37, No. 4, April 1979, pp. 680-685.

For articles on related subject see Nos. 266 and 267.

471. THE DEGRADATION OF QUINTOZENE, PENTACHLOROBENZENE, HEXACHLOROBENZENE AND PENTACHLOROANILINE IN SOIL

by

Jørgen Beck and Knud E. Hansen

Samples of soil previously treated with quintozene was tested to determine its rate of degradation in the soil. Several metabolites of quintozene were found as degradation products in laboratory experiments such as pentachloraniline and methylthiopentachlorobenzene. The fungicide quintozene as well as its impurities and degradation products, even after prolonged periods and in different soil types, consistently showed a strong resistance to continued microbial degradation.

REFERENCE: Pestic. Science, Vol. 5, 1974, pp. 41-48.

472. DEGRADATION OF SEVERAL HERBICIDES IN SOILS UNDER DIFFERENT CONDITIONS

by

Shozo Kuwatsuka

The degradation rate has been compared in this study between upland and flooded conditions. A carbamate and thiolcarbamate type showed difference in the patterns of degradation when compared to other chemicals. Upland conditions seemed to degrade quicker, and benthiocarb could not be linked to the degradation process. Under flood conditions, other chemicals broke down faster than the carbamate types. For example, DDT and BHC degraded faster due to microbes present in flooded conditions. Other information included more bacteria and fewer fungi, and actinomycetes were found in the flooded soils. This could be the reason behind higher degradation of pesticides with an ester mixture applied to the flood site.

REFERENCE: Environmental Toxicology of Pesticides, 1972, pp. 385-400.

473. DENITRIFICATION IN SOIL
I. METHODS OF INVESTIGATION

by

J. M. Bremner and K. Shaw

The Kjeldahl method is used to determine the nitrogen that includes nitrate and nitrite and can be applied to water logged soil. Rapid denitrification of nitrate in the soil can be started by incubation of the soil under water logged conditions with organic materials like glucose and following with a total-nitrogen analyses.

Percentage wise, the level of nitrates was the same no matter how the added nitrate-nitrogens were lost during denitrification. Particles of nitrate in water logged soil containing glucose was observed as having a rapid, but temporary accumulation of large amounts of nitrite and by the forming of smaller amounts of ammonia. Hydroxylamine could not be found during denitrification, but it was discovered that this compound was rapidly decomposed in the soils studied by a process which seemed to be purely chemical.

Denitrification of nitrate in soil is a microbiological process and that the viability of the micro-organisms responsible for denitrification are not affected by air-drying and storage of the soil. Factors affecting denitrification in soil can be studied by determining loss of nitrogens from soil under various conditions by total-nitrogen analysis. The rate of denitrification of nitrate in soil was based on various factors such as pH, temperature and water content of the soil. Some 80-86% of nitrate-N applied to the Rothamsted soils was lost by denitrification in 5 days. The rate was affected by the pH in the soil. The rate is slow at low pH and increases with a rise in soil pH and becomes very rapid when exceeding pH 8.0-8.6. Temperature increased the rate when a change from 2° to 25°C occurred. Optimum temperature was at about 60°C. Water saturation, organic matters present and no loss of nitrogen all affected the ratoe of denitrification. These results received support the idea that denitrification occurs only when oxygen required by soil micro-organisms is restricted.

REFERENCE: Journal of Agricultural Science, Vol. 51, 1958, pp. 22-52.

474. THE DEVELOPMENT OF LABORATORY AND FIELD STUDIES TO DETERMINE THE FATE OF MUTAGENIC COMPOUNDS FROM LAND APPLIED HAZARDOUS WASTE

by

K. C. Donnelly and K. W. Brown

To determine the fate of mutagenic compounds from land applied hazardous wastes, laboratory tests using the salmonella/microsome and bacillus subtilis DNA repair bioassays and field tests with lysimeters were used. The wastes tested for genetic toxicity were refinery and petrochemical sludge. Both of these wastes were shown to be mutagenically active in all fractions extracted. Results from degradability tests are also included in this report.

REFERENCE: Texas Agricultural Experiment Station, Texas A & M University, 1982, pp. 1-15.

For article on related subject see No. 269.

475. DISPOSAL OF OIL WASTES BY MICROBIAL ASSIMILATION

by

H. C. Francke and F. E. Clark

This experiment was concerned with the disposal of plant oil waste products by applying them to soil where microbial assimilation occurs. Both laboratory and field experiments were conducted. Results of this decomposition study showed an adequate degree of microbial activity in degrading the plant oil waste. Waste oil decomposition rates were determined, and no significant problems occurred involving organic carbon or nitrogen loss.

REFERENCE: Union Carbide Corporation, Y-1934, May 1974, pp. 1-44.

For article on related subject see No. 24.

476. DISSIPATION AND LEACHING OF MONURON, SIMAZINE, AND ATRAZINE IN NEBRASKA SOILS

by

O. C. Burnside et al.

This research concentrated on the leaching of monuron, simazine, and atrazine in silty clay loam soil. The two crops used for the experiment were oats and soybeans. Simazine and atrazine were found to be leached more readily in areas of high rainfall. Monuron concentrations remained the highest of the three herbicides studied; however, its toxicity was decreased when leaching was continued over an extended period of time.

REFERENCE: Weeds, 1963, pp. 209-213.

477. THE DISTRIBUTION OF HEAVY METALS IN SOILS AND SOIL MATERIAL AS INFLUENCED BY THE IONIC RADIUS

by

Arne Andersson

Heavy metals were tested for the profile they have in surface soil. In forming, the soil causes some separation in the elements and can cause distribution to be different. A strong link was found between clay and heavy metals. The changing process of soil formation can be affected largely by chemical weathering. The elements are then held in certain levels within the secondary minerals at octahedral positions. The distribution of soil was found to be similar to organic matter in soil profiles.

REFERENCE: Swedish Journal of Agricultural Research, Vol. 7, No. 2, 1977, pp. 79-83.

478. EFFECT OF ENVIRONMENTAL PARAMETERS ON THE BIODEGRADATION OF SOIL SLUDGE

by

J. T. Dibble and R. Bartha

Biodegradation from oil sludge has been evaluated for what affects it may have on "land farming". Oil sludge is usually taken from old refineries as such, and this is then set up for testing. Soil moisture, pH, mineral nutrients, micronutrients, organic supplements, treatment rate, treatment frequency, and incubation frequency all take in affect of biodegradation treatment. At soil water-holding potential, oil sludge biodegradation had a capacity of 30 to 90%. The pH level was 7.5 to 7.8, and the carbon:nitrogen and carbon:phosphorus ratios were 60:1 and 800:1 at a 20°C or above temperature. It was not prosperous to add micronutrients or organic matters. Saturation of hydrocarbon (alkane/cyclo alkane) breakdown is higher when the application is in small amounts. The reverse of this was found that higher application of biodegradation was more effective toward the soil. Following this with small applications was the result of higher biodegradation. Rather than one large application, the small additional applications of two 100,000-liter/hectare or 50,000-liter/hectare oil sludge seemed appropriate for most temperate zone disposal sites.

REFERENCE: Applied and Environmental Microbiology, Vol. 37, April 1979, pp. 729-739.

For articles on related subject see Nos. 25, 62, 274, and 277.

479. EXPERIMENTAL AND PREDICTED MOVEMENT OF THREE HERBICIDES IN A WATER-SATURATED SOIL

by

J. M. Davidson and J. R. McDougal

Measurements of the equilibrium adsorption characteristics of 1,1-dimethyl-3(a,a,a,-tri-fluoro-m-toly) urea (flometuron), 4-amino-3,5,6-trichloropicolinic acid (picloram), and 2,4-bis (isopropylamino)-6-(methylethio-s-tri-azine (prometryne) were taken after solutions where the herbicides were displaced through calcium saturated Norge loam columes of various average pore-water velocities. A kinetic adsorption model in conjunction with transport equations were used to predict the colume effluent herbicide concentration distribution. When measurement and calculation were compared, predicted values showed a similar distribution shift to that of the measured values, but did not agree totally on specific values.

REFERENCE: Journal of Environmental Quality, Vol. 2, No. 4, 1973, pp. 428-433.

For articles on related subject see Nos. 296 and 297.

480. FACTORS INFLUENCING THE ADSORPTION, DESORPTION, AND MOVEMENT OF PESTICIDES IN SOIL

by

George W. Bailey and Joe L. White

A review of literature associated with the adsorption theories of Freundlich, Langmuir, Gibbs, Brunauer, Emmitt, and Teller, adsorption and desorption of organic pesticides by soil colloids, movement of pesticides through soil and off soil surfaces, and physical-chemical properties of soil constituents which influence pesticide adsorption and desorption. The physico-chemical natures of all variables are also detailed in relation to the factors that influence pesticide fate and behavior in soil systems.

REFERENCE: Residue Reviews, Vol. 32, 1970, pp. 29-92.

481. FACTORS INFLUENCING THE BIODEGRADATION OF API SEPARATOR SLUDGES APPLIED TO SOILS

by

K. W. Brown et al.

For complete disposal of hazardous industrial wastes, biodegradation of its components is essential. In order to design a land treatment system, information on rates of degradation as a function of soil morphology and management factors is necessary. This information is also essential to estimate the level of management and the length of time to achieve closure following the last application.

A continuous flow respirometer was utilized to determine the influence of certain environmental parameters on biodegradation of a refinery and a petrochemical waste. By collecting carbon dioxide evolved and residual hydrocarbon analysis, biodegradation rates of two wastes were measured. The microbial population was evaluated six months after incubation had begun. The following environmental conditions were studied: soil texture, soil moisture, mineral nutrient amendments, application rates, application frequency and temperature. The half lives of the refinery sludge and the petrochemical wastes were 141 days and 692 days, respectively. Adding mineral nutrients increased biodegradation rates in the petrochemical waste only. In general, degradation was best at field capacity and when the soil moisture content was greater or lower than the level.

REFERENCE: Texas Agricultural Experiment Station, Texas A & M University, pp. 1-11.

482. FATE AND BEHAVIOR OF FIVE CHLORINATED HYDROCARBONS IN THREE NATURAL WASTES

by

P. C. Oloffs et al.

Three different water samples were treated with five different chlorinated hydrocarbons to determine the fate of each pesticide and its effect on the total number of heterotrophic bacteria. Lindane remained in the water samples during the experiment, while the other agents, DDT, a-chlordane, y-chlordane and Aroclor 1260 (PCB) were generally dispersed throughout the atmosphere. Rapid, uneven distribution of the hydrocarbons resulted in most cases, but were controlled by adding a surfactant to the water. Numbers of bacteria present increased upon application of each pesticide showing that low level chlorinated hydrocarbons do not harm native heterotropic bacteria in natural waters.

REFERENCE: Canadian Journal of Microbiology, Vol. 18, 1972, pp. 1393-1398.

483. FEASIBILITY STUDIES FOR LAND DISPOSAL OF A DILUTE OILY WASTEWATER

by

J. E. Ongerth and S. K. Bhagat

This study evaluated the degradability of dilute oil waste and compiled information for instituting system loading criteria. Information was obtained from the study of land site, soil, and wastewater characteristics. This information included hydraulic and organic loading rates, which could be extended over the entire length of the system. The system involves using pilot scale columns to test waste treatability. Developmental problems of this technique included the slow rate of soil system response and the complexity of the various interactions within the system. Despite these deterrants, it was still possible to evaluate the major clogging potential of the wastewater.

REFERENCE: 30th Industrial Conference, Purdue University, 1975, pp. 850-860.

For articles on related subject see Nos. 29, 71, and 304.

484. FLUORINE: ITS TOXICITY TO PLANTS AND ITS CONTROL IN SOILS

by

A. L. Prince et al.

Sandy loam and loam soils were put to a test to find the toxic level toward buckwheat and tomato plants. Fluorine did become toxic at a level of 360 ppm at a pH value of 6.5. To decrease toxicity, the pH needed to be low and not exceed 180 ppm. These results were taken from loam soil for buckwheat. Tomato plants were tested in sandy loam at pH values 6.5 and a range between 360 and 720 ppm fluorine. Noticeable characteristics of plants with toxicity was browning on tips of the leaves, which will eventually work inward. Whenever lime or phosphate was applied, there was a reduction in toxicity and an increase in production. In comparison, the sandy loam was more severe in toxicity than the loam soils. In conclusion, the level at which fluorine became toxic depended on types of soils, amounts of lime or phosphate and the plants grown in the soil.

REFERENCE: Soil Science, Vol. 67, May 17, 1949, pp. 269-277.

485. GASEOUS DIFFUSION AND POROSITY IN POROUS MEDIA

by

C. H. M. van Bavel

A formula is given which can be used to measure the diffusion of gases through porous media. This formula includes the presence of a gas current and the friction caused by the current. The ratio between diffusivity in a porous environment and a gaseous one was determined to a relatively accurate figure, which correlated well with other studies.

REFERENCE: Soil Science (reprint), Vol. 73, No. 2, February 1952, pp. 91-104.

For articles on related subject see No. 311.

486. HYDROLYSIS OF CIS- AND TRANS-1,3-DICHLOROPROPENE IN WET SOIL

by

C. E. Castro and N. O. Belser

The release of chloride from a solution of 10^{-2}M of cis-1,3-dichloropropene was found to buffer between 6.9 and 7.5 pH level. The chloride showed a difference of points when a mixture of soil solution was mixed in at 0.5, 1, 2, and 3. Independent runs are explained by the points, and in this case there were two. The runs had a maximum pH change from 7.5 to 7.7. Blank readings from the points corrected chloride in the soil water mixture with dichloropropene added. Halide release was insensitive to the soil present. Therefore, the rate of hydrolysis of cis-1,3-dichloropropene with a ratio of 0.5 in only 1.4 times that in the absence of soil. No change is conducted if the ratio is between 1 and 3. The mixture of higher soils enhance the rate to about threefold. Allylic alcohols appear to be the only detectable organic products. Yields of the alcohols were about 40% due to difficulty in extracting them from the soil-water mixtures.

REFERENCE: Journal of Agri. Food Chemistry, Vol. 14, No. 1, January/February 1966, pp. 60-61.

For articles on related subject see Nos. 74 and 317.

487. INVESTIGATION OF LANDFILL LEACHATE POLLUTANT ATTENUATION BY SOILS

by

Wallace H. Fuller

Eleven soils from seven major orders in the United States were studied as to the movement and retention of arsenic, beryllium, cadmium, chromium, copper, mercury, nickel, lead, selenium, vanadium, zinc, and iron that is carried in municipal sewage waste water leachate through soils. Total organic carbon and chemical oxygen demand were also studied as to their relation to municipal sewage waste water.

All results are compiled and are available in this report. Also, a simulation model was developed for predicting solute concentration during leachate flow.

REFERENCE: EPA-600/2-78-158, PB-286-995, 1978, pp. 1-243.

For article on related subject see No. 331.

488. A METHOD TO DETERMINE A PHOSPHORUS ADSORPTION MAXIMUM OF SOILS AS MEASURED BY THE LANGMUIR ISOTHERM

by

Sterling R. Olsen and Frank S. Watanabe

Presented is a method by which the potential phosphorus adsorption of a soil can be calculated. Of two isotherms, the Freundlich and the Langmuir, the Langmuir produced constants with a close assimilation to actual adsorption of phosphorus. Ethylene glycol retention was used to determine soil surface area, which correlated with the adsorption maximum. Conclusions showed that phosphorus retention and bonding energy holding phosphorus was greater in acid rather than alkaline soils.

REFERENCE: Soil Science Society Proceedings, 1957, pp. 144-149.

For articles on related subject see Nos. 34, 80, 83, 85, and 336.

489. MIGRATION OF POLYCHLORINATED BIPHENYLS IN SOIL INDUCED BY PERCOLATING WATER

by

E. S. Tucker et al.

This report attempted to evaluate the use of landfill methods for the disposal of polychlorinated biphenyls (PCBs). The study was specifically concerned with Arochlor 1016, a modified type of PCB, and the leaching rate of percolating groundwater on the substance. Results of tests were conclusive that the amount of PCBs leached from the soil was minimal. In fact, the less chlorinated, the more degradable homologs were the only contaminants subject to excessive leaching. The study also agreed with other sources that PCB contamination in the environment is caused only in a small part by landfill disposal.

REFERENCE: Bulletin of Environmetal Contamination and Toxicology, Vol. 13, 1975, pp. 86-93.

For articles on related subject see Nos. 92, 356, and 357.

490. MOLECULAR MECHANISMS IN THE BIODEGRADATION OF ENVIRONMENTAL POLLUTANTS

by

A. M. Chakrabarty

Man has developed organic compounds (herbicides and pesticides) which have greatly improved agricultural productivity, many of which have been banned because of their environmental persistence to biodegradation. Recent evidence indicates that microorganisms have evolved and are developing the ability to reduce some of these compounds including 2,4-D; 2,4,5-T; and DDM, a metabolite generated from DDT.

Some of the recent discoveries regarding the reasons for and development of the evolution of these microorganisms are discussed in this article.

REFERENCE: American Society for Microbiology, Vol. 44, No. 12, 1978, pp. 687-690.

For article on related subject see No. 364.

491. MOVEMENT AND FATE OF HAZARDOUS MATERIALS IN SOIL SYSTEMS

by

D. D. Kaufman and S. B. Hornick

Because soil has many components that are potential treatment mechanisms, it is possible that it may be used to treat municipal and industrial hazardous waste. The inert rock, gravel and sand, reactive minerals, organic matter, living and dead vegetative matter, animal matter, and soil microorganisms in soil can induce these treatment mechanisms: biological oxidation/reduction, ion exchange, chemical precipitation, adsorption, and assimilation into living plants and animals.

REFERENCE: Proceedings Conferences on Risk and Decision Analysis for Hazardous Waste Disposal, Hazardous Materials Control Research Institute, Silver Spring, MD.

For article on related subject see No. 96.

492. MOVEMENT OF CHLORFENVINPHOS IN SOIL

by

M. J. Edwards et al.

By applying chlorfenvinphos to sloping arable land at 22 kilograms active ingredient per hectare and following its movement, leaching of chlorfenvinphos through soil was studied in two experiments. Only very small amounts appeared later down slope and at the bottom. In one experiment, there was a pond at the bottom of the slope. No pesticide residue was found in the mud or water in the pond. Residues of the main soil metabolites of the pesticide were not found in the pond water at 23 and 36 weeks of its use.

It was found that more chlorfenvinphos leached vertically into drainage water than laterally over the surface in an experiment involving a though containing soil in six separate compartments. Each compartment was five centimeters higher than the one before it. Leachates were collected from the bottom of each, most during the first nine weeks and most from the first compartment. Only small amounts of the insecticide moved down the surface of the slope.

REFERENCE: Pesticide Science, Vol. 2, January-February 1971, pp. 1-4.

493. MOVEMENT OF FLUOMETURON ACROSS AND THROUGH THE SOIL

by

F. L. Baldwin et al.

This experiment determined the effects of initial soil moisture, rainfall and time span on the loss of fluometuron by runoff and leaching. The amount of fluometuron loss was affected to some extent by each of these with antecedent soil moisture being the most critical. Only small amounts of the substances were actually lost. The majority lost, however, still remained in the upper layers of the soil. The highest concentrations occurred on the runoff sediment, but the highest losses were found in the liquid portion of the runoff. Analysis of runoff water, after a one month resting period, showed no signs of fluometuron contamination.

REFERENCE: Journal Environmental Quality, Vol. 4, No. 2, March/April 1975, pp. 191-194.

494. MOVEMENT OF PROMETRYNE THROUGH CONGAREE SOIL INTO GROUND WATER

by

K. S. LaFleur et al.

The movement of prometryne, a type of herbicide, through the soil and into a shallow groundwater table was determined. The chemical was monitored in both the soil and the ground water for 16 months. Upper layers of the soil consistently retained higher concentrations of the substance than the layers below them. Infiltration into the water table was discovered two months after the initial prometryne application. Data concerned with the experiment included rainfall, pore volumes, runoff and drainage. A post-experiment check found no prometryne concentrations in the groundwater after a period of 20 months.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 1, 1975, pp. 132-133.

495. NITRIFICATION OF AMMONIACAL FERTILIZERS IN SOME CALIFORNIA SOILS

by

F. E. Broadbent et al.

This experiment investigated the nitrification of ammoniacal fertilizers under modern fertilization conditions. Conditions found which inhibited nitrification included excessively high or low pH, the presence of free ammonia and high salt concentrations. High concentrations of ammoniacal type fertilizers applied to slightly alkaline soils were found to be the most desirable for the production of nitrates. Moisture and temperature conditions were also found to affect the process.

REFERENCE: Hilgardia, Vol. 27, December 1957, pp. 247-267.

For articles on related subject see Nos. 97 and 98.

496. NUTRIENT AND PESTICIDE MOVEMENT FROM FIELD TO STREAM: A FIELD STUDY

by

J. L. Baker et al.

This field study was designed to provide information pertaining to the effects of different farm management systems on stream water quality. Emphasis was made primarily on the movement of several herbicides and insecticides. The study also included data on runoff loss of nitrogen and phosphorus due to hydrologic factors, which are affected by land management procedures. An attempt was also made to modify a certain runoff model for the purpose of calculating chemical transport between field and stream. Results of experimental procedures showed runoff water as being the primary transporter of herbicides from the field.

REFERENCE: Nutrient Management, pp. 213-245.

For article on related subject see No. 373.

497. OIL DEGRADATION IN SOIL

by

R. L. Raymond et al.

A study was conducted on field soils of the biodegradation of crankcase oil from cars and trucks, an Arabian Heavy crude oil, a home heating number 2, and a residual fuel oil number 6 at three different locations across the United States (Marcus Hook, PA; Tulsa, OK; and Corpus Christi, TX). The study was conducted in 14 field plots of 1.7 meters by 3.0 meters over a period of three years. The oils were added to each at a rate of $11.9 m^3/4X10^3 m^2$ per month. At half of the plots at each location, fertilizers were mixed with the oils into the soils by the use of a rototiller to a depth of 10 to 15 cm. Depending on the type of soil and oil, there was a 48.5 to 90% reduction in oil concentration. Rates of degradation did not exceed $2.4 m^3/4X10^3 m^2$ per month.

With the use of silica gel fractionation, gas chromatography, and ultraviolet absorbence, compositional changes in the oil overtime were studied. Silica gel fractation and gravimetric data showed a degradation of residual oils in all classes of compounds; however, polar type degraded more slowly. The compositional changes were in the same general direction for all but two of the fuel oils.

Studies of runoff water, leachate, and soils showed that water movement did not affect oil loss at the concentrations applied. Observations of lead compounds showed no significant movement. Numbers of hydrocarbon-utilizing microorganisms increased significantly in all plots treated. Increases in hydrocarbon-utilizing fungi did not show up by the plotting technique used. Concentration of residual oil or their oxidation product inhibited plant growth nine months after their application. The compound causing this inhibition could not be determined, nor could their long-term environmental effects.

REFERENCE: Applied and Environmental Microbiology, Vol. 31, No. 4, April, 1976, pp. 522-535.

498. OXIDATION OF THE CARCINOGENS BENZO(A)PYRENE AND BENZO(A)ANTHRACENE TO DIHYDRODIOLS BY A BACTERIUM

by

David T. Gibson

Two carcinogens, benzo(a)pyrene and benzo(a)anthracene, were used as a substrate for a bacterium. An enzyme system of these organisms oxidize certain polycylic aromatic hydrocarbons (PAH) to various dihydrodiols. The primary metabolits of each carcinogen studied was also identified.

REFERENCE: Science, Vol. 189, 1975, pp. 295-297.

499. PESTICIDE MOBILITY: DETERMINATION BY SOIL THIN-LAYER CHROMATOGRAPHY

by

Charles S. Helling and Benjamin C. Turner

Several pesticides, including dicamba, fenac, diuron, trifluralin, atrazine, and CIPA (by their commercial names) were used in conjunction with soils and thin-layer chromotography to determine the mobility of such chemical pesticides in the various soils. This process now called "Soil

Thin-Layer Chromotography" is a rapid and reproducible method for observing chemical mobility in soil. Of 16 pesticides tested by this process, it was shown that acidic herbicides had had the most mobile tendencies, while insecticides comprised by chlorinated hydrocarbons showed low mobile tendencies.

REFERENCE: Science, Vol. 162, 1968, pp. 562-563.

500. PHOSPHATE REMOVAL BY SOIL IN RELATION TO WASTE DISPOSAL

by

J. Beek, F. A. M. de Haan

In the Netherlands, a sewage farm located near Tilburg was used during the past 50 years as irrigation of domestic sewage water. Samples of the soil were selected from both flooded areas and studied for aluminum, iron, and phosphate chemicals. Ninty-six percent of the contents taken from the soil was phosphate. Net total phosphate and phosphate stored appeared in agreement when analyzed on a balance-sheet of calculations. Six days was the longest time of residence of sewage water, and the retention was attributed to adsorption reactions and precipitation. During precipitation, phosphate can appear as calcium, aluminum or iron phosphates. The requirements for calcium ions are provided through the sewage water. Furnishing aluminum and iron ions is accomplished by soil compounds. Found in the drainage water is the correct concentration of phosphate soil pH level. This is assuming several solid phases known to happen in soils are present.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 77-86.

For article on related subject see No. 35.

501. PHOSPHORUS ADSORPTION SITES IN SOILS

by

Robert D. Harter

This study examined through tests the phosphorus adsorption sites in soils. The study of phosphorus adsorption as an operation of five soil types showed that organic matter was important in the initial bonding of phosphorus by soils. It appears through several studies, that adsorbed phosphorus is basically bonded to organic matter rather than aluminum. It then can be found that adsorbed phosphorus is linked to iron and aluminum in acid soils. It then concluded that phosphorus is primarily bonded to anion exchange sites on organic matter and changed into less soluble ion and aluminum phosphates.

REFERENCE: Proceedings of Soil Science Society of America, Vol. 33, 1969, pp. 630-632.

502. PLANT-SOIL ASSIMILATIVE CAPACITY FOR ORGANIC SOLVENT CONSTITUENTS IN INDUSTRIAL WASTES

by

D. Pal et al.

This article states that two cornerstone parameters must be carefully investigated when a landtreatment design for organic solvents is being determined. The first consideration is the critical concentration of a specific solvent in a soil above which adverse responses in plants, microflora, and soil are noted. The second is the rate of loss or decomposition of a specific solvent from a soil system. These two components considered together are of priority importance when determining the overall space needed for a land application site.

REFERENCE: Proceedings of the 32nd Industrial Waste Conference, Purdue University, 1977, pp. 259-271.

For articles on related subject see Nos. 186 and 384.

503. RECLAMATION OF SOIL CONTAMINATED WITH OIL

by

R. B. Schwendinger

This article investigates the use of bacterial seeding as a means for reclaiming soils contaminated by oil. Laboratory results showed that even high soil contamination levels can be reduced by this method. Of particular interest is the reclamation of soil after a significant oil spill since large amounts of oil damage plants by anaerobic and hydrophobic conditions. This creates an interference with soil-plant-water relationships.

REFERENCE: Journal of the Institute of Petroleum, Vol. 54, No. 531, July 1968, pp. 181-197.

For article on related subject see No. 110.

504. THE RELATION OF HYDROGEN-ION CONCENTRATION TO THE AVAILABILITY OF ZINC IN SOIL

by

Wreal L. Lott

This experiment was designed to gather data on the effects of pH on zinc availability in soil. The experiment was conducted using oat seedlings grown in slightly acid soils. The detrimental effects of excessive zinc were found to be prevented by the application of calcium carbonate. By ammending the soil to reach a slightly acid pH once again, zinc concentrations were returned to a non-toxic level. In addition, the use of zinc sulfate for various reasons may result in an increase in zinc concentrations in the soil.

REFERENCE: Soil Science Proceedings, 1938, pp. 115-121.

505. REMOVAL OF HEAVY METALS FROM WASTEWATER AND SLUDGE BY ADSORPTION ONTO SOLID WASTES

by

N. A. Poonawala et al.

This report deals with investigations into the use of solid wastes to remove heavy metals from municipal wastewater and secondary sludges. Results revealed municipal wastewaters and secondary sludges contain some organic residues that can form stable complexes with toxic heavy metals, such as copper, zinc, lead, cadmium, nickel, and mercury. These tend to decompose quickly, thus releasing dangerous metals into soils they have been disposed on. Municipal wastewater and secondary sludge can be amended with less soluble organic wastes, such as composted pine bark, corn cobs, peanut hulls, and ground rubber scraps, which can greatly slow down the decomposition rate. This provides a protective effect to the soil, plants, and animals and allows a slow rate of release of heavy metals, which can then be utilized as trace elements.

REFERENCE: Wateruse, Proceedings of the 2nd National Conference, 1975, pp. 241-254.

506. REMOVAL OF PLUTONIUM-239, TUNGSTEN-185 AND LEAD-210 FROM SOILS

by

D. O. Wilson and J. F. Cline

This experiment studied the removal of plutonium-239, tungsten-185 and lead-210 from the soil by plants. Barley was grown in a number of different types of soil containing the various isotopes. Only minute quantities of the lead and plutonium isotopes were absorbed by the barley, while tungsten-185 accumulations were significantly larger. Factors seeming to affect radioisotope availability to plants included acidity, to some degree, and soil type, which greatly influence plant uptake. No detrimental effects were found as a result of the nuclides to either plant appearance of crop yield. The report also presented information proving the unreliability of soil extracting procedures to estimate radioisotope quantities.

REFERENCE: Nature, Vol. 209, February 26, 1966, pp. 941-942.

507. RESPIRATION STUDIES ON SOIL TREATED WITH SOME HYDROCARBONS

by

Ann L. Dobson and H. A. Wilson

Two types of soils were chosen to measure the respiration by uptake of O_2. The soils included oil free soil and oil-impregnated soil. By using the Haldene device, the soils around oil wells revealed large biological activity. On the other hand, respiration was higher in the soils that were oil-free. Following application of crude oil, mineral oil, and kerosene, the reactions were much as expected. Each applicant had similar effects, but were slightly different in the biological activity. Respiration rate was shown to be higher in the soils with applied hydrocarbons.

REFERENCE: Soil Science Society of American Proceedings, Vol. 28, 1964, pp. 536-539.

508. RETENTION AND RELEASE OF MOLYBDENUM BY SOILS

by

S. G. Misra et al.

Variable amounts of molybdenum are retained when MoO_4^{2-} is applied to soils. To hold the pH on a level, it was found that it could be done by conditioning with calcium carbonate, organic matter content, various complexants, (Cu^{2+}, Zn^{2+}, Mn^{2+}, and Al^{3+}) and macronutrient fertilizers. Although the maximum of molybdenum pH is between 3.0 to 5.0, it can continue as high as 8.5. When organic matter is removed from the starting soils, it can cause molybdenum to decrease as much as 16.8% to 25.9%. Zinc and aluminum ions increased retention in the soils for molybdenum, but other ions varied in whatever the soil type. The type of soil was a good indication of an increase or decrease in the retention in monocalcium phosphate. Similarly, aluminum reacted the same way in showing no effect or an increase on retention. Complexants were useful in releasing molybdenum in the soils. Various methods and combinations of the complexants or organic matters applied caused different responses during testing.

REFERENCE: Molybdenum in the Environment, Vol. 2, pp. 597-618.

509. RETENTION OF PHENOLIC ACIDS BY NONCRYSTALLINE HYDROXY-ALUMINUM AND -IRON COMPOUNDS AND CLAY MINERALS OF SOILS

by

P. M. Huang et al.

In young plants, certain conditions can prohibit growth. Adsorbing phenolic acid is one such condition. A study done in Taiwan showed such evidence as being affirmative. Four soils that were selected for testing purposes along with kaolinite, illite, vermiculite and compound hydroxy-aluminum and iron were inhibitive toward growth of plants. Steric hindrance and negative repulsion caused vermiculitic minerals not to turn down the retention of phenolic acids. By taking out the noncrystalline components of the soil, it lowered the adsorption rate of acids by the plants. The positive charge from $Al\text{-}OH_2^{0.5+}$ and $Fe\text{-}OH_2^{0.5+}$ caused the noncrystalline component to have such an effect in the adsorption rate of acids.

REFERENCE: Soil Science, Vol. 123, No. 4, April 1977, pp. 213-219.

510. SOLUBILIZATION OF POLYCYCLIC HYDROCARBONS

by

H. B. Klevens

This experiment studied the solubility of several polycyclic hydrocarbons. Linear relationships were found for all the hydrocarbons tested by plotting them against either the molecular length or the molar volume. Slope of the graphs changed most significantly with benzene followed by toluene ethylbenzene and n-butylbenzene. A zero slope was finally reached for the condensed-ring polycyclics. Data which agreed with past findings was also gathered for alkylbenzenes, naphthalene, phenanthrene, and dimethylamino-azobenzene solubilization.

REFERENCE: Journal of Physical and Colloid Chemistry, Vol. 54, 1950, pp. 283-298.

For articles on related subject see Nos. 38, 39, 191, 206, and 121.

511. SORPTION AND DESORPTION OF COPPER BY AND FROM CLAY MINERALS

by

Fawzy M. Kishk and M. N. Hassan

When copper is sorbed by clay minerals, the higher the pH, the more copper is sorbed. This is due to greater hydrogen + ion competition at low pH values with copper ++ ions, and the fact that increased pH produces an increased solubility produce (K_{sp}). At low pH, octahedral ions also compete with copper ++ ions.

When copper is extracted from clay minerals, a function of pH is again noted. With all clay minerals, the higher the pH, the less copper could be extracted.

The hydrogen + ion competition may account also for the calcium-copper isothermic exchange. At pH 3.5, copper clay doesn't generate from calcium clay, but at pH 5.2, copper-montmorillonite (clay) generates clacium-montmorillonite spontaneously; 3.2 pH gives positive free energy; 5.2 pH gives negative free energy.

REFERENCE: Plant and Soil, Vol. 39, 1973, pp. 497-505.

512. SORPTION AND OXIDATION OF MANGANOUS IONS AND REDUCTION OF MANGANESE OXIDE BY CELL SUSPENSIONS OF A MANGANESE OXIDIZING BACTERIUM

by

S. M. Bromfield and D. J. David

Arthrobacter, cells from soil, and manganese oxide were put together, and manganous ions (Ma^{2+}) adsorbed from aqueous solutions. Copper ions could be desorbed by regular ions. When the mixture of cells reach a rate of oxidation below pH 5.7 or above pH 7.5, this is unstable. A pH of 6.5 is the maximum rate for oxidation. The rate of changes during oxidation is very sensitive, which causes the pH level to stay within a limit of 5.7 to 7.9. Concentrations of 0.5 and 6 mm of manganous ions had very small effects on the oxidation rate. Methylene blue had an inhibiting affect on the oxidation of manganese cell suspensions. Cells of soil Arthrobacter sp. and the manganese oxide they formed quickly absorbed manganous ions (Mn^{2+}) from aqueous solutions.

REFERENCE: Soil Biol. Biochem., Vol. 8, May 1975, pp. 37-43.

513. SORPTION OF DIBENZOTHIOPHENE BY SOILS AND SEDIMENTS

by

J. J. Hassett et al.

A heterocyclic sulfur compound, dibenzothiophene, which has been identified in used crankcase oil, storm run-off water particulates, coal-gasification waste water, leachates from coal storage sites, and in Delaware River sediments, was analyzed to determine its solubility in water and its sorption by various soils. Dibenzothiophene, and its sorption is due to weak solute-solvent interaction (hydrophobic sorption).

REFERENCE: Journal of Environmental Quality, Vol. 9, No. 2, 1980, pp. 184-186.

514. SPRAY RESIDUES AND CROP ASSIMILATION OF ARSENIC AND LEAD

by

J. S. Jones and Miles B. Hatch

This study was concerned with the uptake of arsenic and lead by plants and the possible poisoning to animals or people using the plants as food. Of the studies conducted, no danger was found to human or livestock which consumed the plants. The primary problem with arsenic or lead being present is the reduced growth or yield of the plant itself.

REFERENCE: Soil Science, Vol. 60, 1945, pp. 277-288.

For article on related subject see No. 454.

515. STUDIES ON SOIL COPPER
II. THE SPECIFIC ADSORPTION OF COPPER BY SOILS

by

R. G. McLaren and D. V. Crawford

A study of soil adsorption isotherms was conducted to determine specific adsorption of copper in soils and soil constituents. The Langmuir adsorption was the equation found to have two important constants; one the adsorption maximum and the other the bonding term. Two other factors in adsorption are organic matter and free manganese oxides. These are solid contributors for adsorption and come in a specific order. Manganese oxides come first with organic matter next in line. Following these two are the iron oxides and clay minerals. These four are helpful in location of whole soils. The pH level of adsorption in the study of soil copper was best at 5.5 with maxima adsorption between 340 and 5780 $\mu g\ g^{-1}$. Test soils are much greater in cation exchange limit than a specific adsorption maximum. The important factor to remember is that specific adsorption is more important for smaller amounts of soil copper to control in the concentration process.

REFERENCE: Journal of Soil Science, Vol. 24, 1978, pp. 443-452.

516. STUDIES ON THE METHANE FERMENTATION V. BIOCHEMICAL ACTIVITIES OF METHANOBACTERIUM OMELIANSKII

by

H. A. Barker

This paper determined the compounds which can be oxidized by a specific bacteria; what can replace carbon dioxide as an oxidizing agent; and the source of cell carbon? Of the experiments conducted, only simple primary and secondary alcohols were utilized by the bacteria. Growing cultures were used to determine other oxidizing agents, which could replace carbon dioxide. Oxygen and nitrogen were found to be toxic in this test; sulfate and methanol showed no significant effects leaving formate as the only tested substance utilized. Carbon assimilation data showed the majority of carbon being derived from ethanol with a significantly smaller percentage being assimilated from carbon dioxide. This establishes the fact that carbon dioxide is not the sole source of carbon in this reaction.

REFERENCE: Biological Chemistry, Vol. 127, 1941, pp. 153-167.

517. TRANSFORMATION OF ACETATE CARBON INTO CARBOHYDRATE AND AMINO ACID METABOLITES DURING DECOMPOSITION IN SOIL

by

L. H. Sørensen and E. A. Paul

Carbon and the formation it makes when mixed into heavy clay soil during decomposition was the focus of this study. The carbon changes from acetate carbon into carbohydrates and amino acids when the clay pH is 7.6. Following 6 days in incubation at 25°C some 70% of the acetate changed into carbon dioxide. After four days, 19% of carbon residual was found in carbohydrates, 28% in amino acids, and 21% insoluble residue in the soils. Chemical compounds breaking down at different times followed the formation of carbohydrates and amino acids after 30 days in incubation. After 200 days of incubation, only 2.2% of the original carbon was located in the carbohydrates, 7% in the amino acids, and 5% in the insoluble residue. Carbohydrates were found to decay at a faster rate than amino acids in this test. A protective mechanism is the reason for different rates of decay from the substances.

REFERENCE: Soil Biol. Biochem., Vol. 3, 1971, pp. 173-180.

518. TRANSPORT, DETOXIFICATION, FATE, AND EFFECTS OF PESTICIDES IN SOIL AND WATER ENVIRONMENTS

by

R. A. Leonard et al.

Despite the fact that pesticides are poisonous to at least some segment of the ecosystem, they have become indispensable tools in agriculture, and their use is expected to continue. Before man should continue the use of pesticide, knowledge of transport systems is required. Four main discussions of transport are land to water, land to atmosphere, atmosphere to land, and atmosphere to water. The ultimate fate of pesticide depends upon these transport systems.

The main topics discussed in this article are as follows: pesticide production and use, pesticide properties, pesticide adsorption reaction in soils, pesticide persistence in soils, pesticide losses to the atmosphere, pesticide mobility and leaching and leaching in soils, pesticide runoff, pesticide fate in the aquatic environment, aquatic effects of pesticides, and management of pesticide wastes. Fifteen tables are included to illustrate such things as pesticidal herbicide production in the United States; pesticide market and prices; solubility, vapor pressure, and toxicity of selected herbicides/insecticides; physical properties of soil constituents; pesticide persistence in soils, common and chemical names of pesticides; mobility of selected pesticides; runoff losses; biomagnification of DDT residues; and factors affecting pesticide fate and potential environmental impact of land disposal.

REFERENCE: Land Application of Waste Materials, 1976, pp. 48-78.

519. USE OF POROUS CERAMIC CUPS TO SAMPLE SOIL WATER WITHIN THE PROFILE

by

George H. Wagner

Described is a simple infield piece of equipment for sampling soil water without disturbing surrounding soil to great extents as do trench lysimeters. This method cannot sample suspended solids due to filter affect of the ceramic cup.

REFERENCE: Soil Science, Vol. 94, 1962, pp. 379-386.

For article on related subject see No. 431.

520. ACCUMULATION OF SODIUM IN POTTED SOIL IRRIGATED WITH PULPMILL EFFLUENTS

by

K. Kadambi, Ph.D.

This experiment studied the accumulation of sodium in a number of potted plants, which were irrigated with three pulpmill effluents; one was acid, one was alkaline, and one was a neutral solution. With the exception of one plant, all levels of soil sodium rose after neutral solution treatment varied with alkaline treatment and declined with acid treatment. Acid effluents were also found to reduce the level of magnesium, calcium, and potassium concentrations considerably. The study concluded that land irrigated with pulpmill effluents may require supplemental fertilization.

REFERENCE: Consultant, Vol. 16, 1971, pp. 93-94.

For articles on related subject see Nos. 137, 209, and 210

521. THE ACUTE TOXICITY OF SIX MONOCYCLIC AROMATIC CRUDE OIL COMPONENTS TO STRIPED BASS (MORONE SAXATILIS) AND BAY SHRIMP (CRAGO FRANCISCORUM)

by

Pete E. Benville, Jr. and Sid Korn

Acute toxicities were determined by static bioassay for striped bass and bay shrimp. Some of the toxicities include benzene, toluene, ethylbenzene, p-xylene, m-xylene and o-xylene. By using gas chromatography, the solubilities of seawater with salinity of 25% with aromatics were used as a procedure for dosing the animals. An example of the solubilities were 1400, 330, 180, 210, and 230 μ/l ppm. It was found these lethal enough to be used against striped bass and bay shrimp. The aromatics effect was more effective in the shrimp rather than in fish when compared in the tests ranging between 24 and 96 hours.

REFERENCE: California Fish and Game, Vol. 63, 1977, pp. 204-209.

522. ACUTE TOXICITY OF 12 INDUSTRIAL CHEMICALS TO FRESHWATER AND SALTWATER ORGANISMS

by

M. W. Curtis et al.

Using the 96 hour LC50 test, 12 industrial chemicals were tested to determine their toxicity of fresh and saltwater animal species. The two species used in the test were the freshwater Fathead Minnow, Pimephales Promelas, and the saltwater Grass Shrimp, Palaemonetes Pugio. In freshwater ammonium fluoride, arsenic trisuleide, benzoyl chloride, cupric acetate, o-dichlorobenzene, p-dichlorobenzene, mecuric acetate, mecuric thiocyanate, resorcinol, sodium hypochlorite, and toluene-2,4-diisocyanate were all toxic. In saltwater, all except toluene-2,4-diisocyanate were toxic. All experimental procedures and result calculations are included in the report.

REFERENCE: Water Research, Vol. 13, 1979, pp. 137-141.

523. ADVANCED TREATMENT APPROACHES FOR METAL FINISHING WASTE WATERS

by

Herbert S. Skovronek and Mary K. Stinson

EPA has been involved for several years in developing and demonstrating methods for the control, recycle, and destruction of water pollutants generated in the electroplating and related industries. This paper examines a number of the newer technologies, describes applications in which EPA's R & D program has been involved, and presents cost figures generated as the result of these studies. All EPA projects are referenced, so that the reader can pursue those of particular interest in greater detail.

REFERENCE: EPA, 600/J-77-056b, October 1977, pp. 1-10.

For article on related subject see No. 461.

524. AERATED LAGOON AND HYDROGEN PEROXIDE TREATMENT FOR THE EFFLUENT FROM A PENTACHLOROPHENOL WOOD PROCESSING PLANT

by

John Ball and Vicky R. Wilson

The use of aerated lagoons was assessed and compared to hydrogen peroxide treatment for controlling phenol, COD and oil and gas concentrations from wood processing wastes. Laboratory tests using hydrogen peroxide treatment show good phenol removal, but when full scale tests were conducted, its effectiveness was inadequate especially in COD reduction. The three-cell lagoon pilot plant adequately reduced all constituents under concern. The only problem with the aerated lagoons was the necessity of a larger land area.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 48-56.

525. ANALYSIS OF POLYCYCLIC ORGANIC MATERIALS IN COAL, COAL ASH, FLY ASH, AND OTHER FUEL AND EMISSION SAMPLES

by

A. G. Sharkey et al.

The report gives results of a high-resolution mass spectrometric investigation to determine the major polynuclear aromatic hydrocarbons (PNA) in samples derived from various fuel conversion processes and related plant emissions. Studied were particulate materials and extracts of hydrocarbons in the particulate materials collected on filters placed in flue gas streams from coking, smelting, and similar industrial operations. The analysis considered 14 highly carcinogenic PNAs, with nine unique formulas. Additional quanitative data were obtained by low ionizing voltage techniques for major aromatic hydrocarbon classes, where possible. The gases evolved from the particulate samples that were also identified.

REFERENCE: EPA 600-2-76-075, March 1976, pp. 1-31.

For articles on related subject see Nos. 218 and 219.

526. ANALYTICAL STUDIES OF METABOLISM OF TERRACLOR IN BEAGLE DOGS, RATS, AND PLANTS

by

Edward J. Kuchar et al.

Tests were done on Beagle dogs fed Terraclor for a period of two years. The PCNB present in the food contained pentachloroaniline and methyl pentachlorophenyl sulfide. The evidence of these metabolic products was based on mass spectroscopy. Tests were given on rats and plants in which the results revealed similar metabolism.

REFERENCE: Journal of Agricultural Food Chemistry, Vol. 17, No. 6, November/December 1969, pp. 1237-1240.

527. APPLICATION OF EXCHANGE RESINS FOR TREATMENT OF TEXTILE DYE WASTES

by

Allison Maggiolo and J. Henry Sayles

Various commercially attainable resins were tested separately and in combination as to their ability to remove textile dye wastes from the effluent. These resins, both ionic and neutral plant (direct, acid, basic, vat) dye effluents. However, dispersed dyes could not be removed by these resins. After special investigation, treatment of a dispersed dye effluent with a neutral resin column followed by treatment with a weak base column resulted in a complete color removal.

REFERENCE: EPA-600/2-75-016, 1975, pp. 1-39.

528. APPLICATION OF REVERSE OSMOSIS TO AUTOMOTIVE ELECTROCOAT PAINT WASTEWATER RECYCLING

by

J. E. Anderson et al.

This report describes field and bench-scale experiments with a cellulose acetate membrane reverse osmosis unit and wastewater from automotive electrocoat operations. In operation, the feed water permeated through the membrane along with some solutes, which are recycled for reuse later. This practice eliminated the need for a flux reduction mechanism. Also, experiments were conducted when colloidal lead was present in the feed water. This caused only slight fouling of the membrane, which could be cleaned weekly with dilute lactic acid.

REFERENCE: Desalination, Vol. 36, No. 2, 1981, pp. 178-188.

529. APPLICATION OF REVERSE OSMOSIS TO ELECTROPLATING WASTE TREATMENT
Part IV

by

A. Golomb

This study looks at the application of reverse osmosis to electroplating waste treatment. Of technical and economic studies done, the results showed that a cooperative venture by a group of small plating shops can change acid dragout losses to a 70% $^{w}/w$ aqueous solution of sodium dichomate, which could possibly be used by leather tanneries of chrome pigment manufacturers. This would present a more environmentally acceptable method of dealing with chromium plating wastes than chemical reduction and sludge disposal. The proposed study would require cooperation between an important number of small job-shop platers in the area; it would be expected that some practical organizational problems would have to be solved. The estimated cost of treatment would be approximately 90¢/lb of chromic acid removed. An adequate amount of planning and foresight would be required to ensure effective implementation of the proposed concept.

REFERENCE: Plating, Vol. 61, No. 10, October 1974, pp. 931-934.

530. AQUEOUS SOLUBILITY, ADSORPTION, AND VAPOR BEHAVIOR OF POLYCHLORINATED BIPHENYL AROCLOR 1254

by

Rizwanul Haque et al.

The solubility of Aroclor 1254 was determined to be in the form of 56 ppb. A factor is the nature of the adsorbent when comparing dependability of soils. Some soils adsorb very little compared to other types of soils. The less vapor used, the more important the data was when Aroclor was taken from a sand base. When temperatures rise, usually the vapor loss becomes greater. In conclusion, it is a known factor that the fewer chlorines an isomer contains, the greater the loss will be in the atoms.

REFERENCE: Environmental Science and Technology, Vol. 8, No. 2, February 1974, pp. 139-142.

531. ARSENIC SOLUBILITY IN A REDUCED ENVIRONMENT

by

Lloyd E. Deuel and Allen R. Swoboda

Soluble arsenic levels were shown to be relative to total arsenic found in flooded soils in lower environment collected. Equilibration of flooded soils were at 25%C gathered from concentrations of arsenic ranging from 0.06 to 0.18 ppm when treated with 0.568 mg of arsenic per 100 grams of soil. Following this procedure, it is applied to the soil as sodium arsenite. At 25%C, the balance of arsenic found was not significant in which had not been treated with arsenic. Higher balance of samples at 38%C turned out to have higher soluble arsenic concentrations. The range of soluble arsenic varied between 0.15 ppm with no arsenic addition to 0.79 ppm with 1.135 mg of arsenic per 100 grams subjected from the soil. Higher soluble arsenic was in greater levels from a reduced environment. Balance samples at 38%C were decreased more by concentration level than compared with the balance of 25%C. The expansion of soluble arsenic in lower reduction levels was accountable to decreases in lead and not arsenic reduction itself. In the soil samples, arsenic was not detected at all.

REFERENCE: Soil Science Society America Proc., Vol. 36, 1972, pp. 276-278.

For articles on related subject see Nos. 139, 222, and 223.

532. ASSESSING THE PERFORMANCE OF PRESERVATIVE TREATMENTS OF WOODEN JOINERY

by

Janice K. Carey

Comparisons of tri n-butyltin oxide (TnBTO) and pentachlorphenol (PCP) were made as to their performance as a preservative in wood joints. Destructive examination methods were used to analyze the wood samples after a given period of time. Data showed a complex sequence of colonization involving bacteria, blue stain fungi, soft rot fungi and Basidiomycetes. This colonization along with permeability increases in the wood were consistently inhibited by immersion treatments. In comparison, PCP treatments were more effective in delaying initial colonization and activity of the organisms than was the TnBTO.

REFERENCE: Holz als Roh-und Werkstoff, Vol. 40, 1982, pp. 269-274.

For articles on related subject see Nos. 224 and 462.

533. ASSESSMENT OF EMERGING TECHNOLOGIES FOR METAL FINISHING POLLUTION CONTROL: THREE CASE STUDIES

by

P. Militello

This research program was initiated with the objective of bringing information concerning performance and cost of new waste water treatment technologies to the attention of the metal finishing community. Many novel approaches to treatment of electroplating waste water have been evaluated based on available information under an earlier effort. The most promising of these were selected for further investigation to include sampling, performance verification, and cost analysis. This report presents the results of that investigation for the three emerging technologies selected. The treatment methods included a system for treatment of electroplating wastes with ozone, a technique for chrome recovery by ion transfer, and a method of treating mixed waste streams using ion exchange. Performance of each of these technologies was evaluated through sampling and analysis for prototype operation under normal production conditions. Performance data and cost projections for each system are presented herein.

REFERENCE: EPA, 600/2-81-153, August 1981.

534. ASSESSMENT OF HAZARDOUS WASTE PRACTICES IN THE PETROLEUM REFINING INDUSTRY

by

D. G. Rosenburg et al.

Waste streams from 16 refineries were sampled and chemically analyzed. Principal hazardous waste found was oil at 110,000 metric tons per year; fluoride was next at 812 metric tons per year. Heavy metals totaled 250 metric tons per year. Phenol, cyanide, and benz-a-pyrene totaled to 6 metric tons per year. On site disposal and waste reduction was predicted to increase due to more recycling, material reclamation, and product recovery. Costs of presently implemented treatment were also included.

REFERENCE: EPA/SW-129C, PB 259-097, 1976, pp. 1-352.

535. ASSESSMENT OF INDUSTRIAL HAZARDOUS WASTE PRACTICES-TEXTILE INDUSTRIES

by

E. F. Abrams et al.

Textile industries that fall in (SIC) class 22 were examined as to their land destined wastes. Some textile industries use chromium and copper in dyeing and finishing operations, and as of this report data, no toxic levels of these chemicals were found in the land destined effluent wastes of these industries. But the amount of future treatment sludge is to increase with the implementation of effluent guideline limitations.

REFERENCE: EPA/SW-125C, PB-258-953, 1976, pp. 1-276.

536. ATTEMPTS TO QUANTITATE THE PROTECTIVE EFFECT OF SELENIUM AGAINST MERCURY TOXICITY USING JAPANESE QUAIL

by

M. M. El-Begearmi et al.

This experiment quantified the amounts of selenium needed to affect mercury toxicity in quail. In all cases, an increase in the selenium consumption (which was only tested up to 6 ppm) increased protection from a fixed amount of mercury in the quail's diet. There was no significant survival rate in quail receiving no selenium. Survival percentages increased with selenium concentrations to a period of 67 days. However, most all quail which received the mercury died at a later date.

REFERENCE: Federation Proc.-American Society for Experimental Biology, Vol. 32, 1973, p. 886.

537. AUTOMATIC MONITORING OF COPPER IN WASTE WATER FROM PLATING SHOPS

by

J. B. Vanhumbeeck

This paper studies the use of automatic monitoring of copper in waste water from plating shops. Waste water from plating shops can be monitored three ways: 1. by the entrance of the treatment process to calculate the total amount of pollutants, 2. by the process of operational control, and 3. when leaving the plant site for emission control. The process for treating copper contaminated waste water is not always safe, and in view of low discharged limits, continuous monitoring of the copper concentration of the discharged water is highly advised. A new automatic monitoring system has been developed; it is based on a colorimetric procedure with bathocuproin sulphonic acid, i.e. the German standard method. By using the analytical procedure for automation, the wear and case of the upkeep necessary for working under conditions and by also using a microcomputer based electronic control and data treatment system, a very sure and safe monitoring system was gained.

REFERENCE: Water Science Technology, Vol. 13, 1981, pp. 539-544.

538. AVAILABILITY OF MOLYBDENUM AS INFLUENCED BY LIMING

by

W. O. Robinson et al.

A field selected at random with a pH of 5.5 to 5.8 and containing 31.5 ppm. of molybdenum was partitioned and limed in a greenhouse. Liming procedures were conducted at the rate of pH 7 and pH 7.6. Crops included in analysis were ryegrass, crimson clover, alfalfa, and Austrian winter peas. Molybdenum shown in ryegrass increased during the second cutting, but a small increase in the first and third cuttings while liming was administered. The remaining three crops show an increase by liming. Ratio in the three crops ranged from six to elevenfold, while increasing the rate of liming. Alfalfa, crimson, clover, and Austrian winter peas content of molybdenum can be increased to a point of being toxic to cattle with great amounts of liming. This correlates if the soils are high in molybdenum and retain acid. Ryegrass is not effected as much by molybdenum content as that of legumes.

REFERENCE: Soil Science, Vol. 72, 1951, pp. 267-274.

539. BERYLLIUM

by

L. B. Tepper

This paper discusses the topic concerned with the toxicity of beryllium. It gives a detailed account of such things as sources of exposure, symptoms, beryllium related illnesses and treatment, toxicology and carcinogenic factors. Also presented are a number of analytical methods for the detection of beryllium concentrations. The final goal of this study was to establish a report which would explain the biological properties of beryllium.

REFERENCE: CRC Critical Reviews in Toxicology, July 1972, pp. 235-259.

For articles on related subject see Nos. 230 and 464.

540. BIODEGRADABILITY OF HYDROCARBONS IN THE REFINERY WASTEWATER FROM MOUSTOROD OIL REFINERY

by

Ahmed S. Moursy and Mohamed M. El-Abagy

Refinery wastewater containing hydrocarbons were used in conjunction with Pseudomonas aeruginosa in laboratory tests. Most of the hydrocarbon compounds were degraded totally after seven days of exposure to the microbial flora. Only four compounds, all (n-paraffins), were not completely degraded. Degradation without exposure to Pseudomonas aeruginosa took 23 days.

REFERENCE: Proceedings of the International Symposium, 1982, pp. 453-466.

541. BIODEGRADATION RATES OF ISOMERIC DIHEPTHLBENZENE SULFONATES

by

R. D. Swisher

Microdesulfonation and capillary gas chromatography can be used to quantitatively determine the relative rates of biodegradation of isomeric straight chain dihepthlbenzene sulfonates in an activated sludge culture. A faster rate of degradation is thought to be a result of a greater distance between the sulfonate group and the farthest end of the alkyl chain.

REFERENCE: Developments in Industrial Microbiology Proceedings, Vol. 4, 19th general meeting, 1962, pp. 39-45.

542. BIOLOGICAL REMOVAL OF CARBON AND NITROGEN COMPOUNDS FROM COKE PLANT WASTES

by

John E. Barker and R. J. Thompson

A one-year study of a biological process for treatment of coke plant ammonia liquor was conducted. The process was designed to remove carbon compounds and ammonia. The pilot plant consisted of three treatment systems arranged in series. These systems were designed for the removal of carbon compounds, the oxidation of ammonia to nitrate (nitrification), and the reduction of nitrate to nitrogen gas (denitrification). The results of the study indicate that the biological process can be used to remove carbon compounds and ammonia from dilute ammonia liquor. Treatment efficiencies obtained include removals of greater than 99.9% phenol, 80% COD, and 90% ammonia. Removal efficiencies for cyanide and thiocyanate were less encouraging with averages of 57 and 17%, respectively.

REFERENCE: EPA, R2-73-167, April 1973.

543. BIOLOGICAL TREATMENT OF COKE PLANT WASTES UTILIZING AN INTEGRAL CLARIFICATION CONCEPT

by

Myrl R. Wear et al.

This paper deals with the treatment of the sanitary sewage, ammonia still waste, and the benzol plant waste at Armoc's Hamilton Coke plant located at New Miami, Ohio. The treatment of coke plant waste to attain phenol and ammonia removal in a single stage reactor has shown to be a conscious treatment method, even though expensive when used in series with a caustic soda ammonia still. The controlling of pH is the most difficult factor because of the formation of acid in the treatment process and the destruction of the available alkalinity. No problem was presented in negative effects on nitrification or phenol removal by the introduction of emulsified oil. Also, operating the system with extremely high mixed liquor and long sludge ages in the aeration basin has not presented any problems. Even though the operations of the plant have run smoothly, the plant only operated six months of satisfactory nitrification of the thirteen months of being open. Nitrification has only occurred during winter months, and it is necessary for complete demonstration of the plant to obtain a full year of working evidence.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 343-353.

544. BIOOXIDATION OF PAINT PROCESS WASTEWATER

by

James A. Brown, Jr. and Marvin Weintraub

This paper presents a study on the biodegradability characteristics of a paint process wastewater effluent. In cellosolve biodegradation experiments, influent and effluent samples from the biooxidation cells were examined by gas chromatography for cellosolve. It was found that chemical oxygen demand (COD) reduced 39% at 1.2 days' residence time to about 87% at 2.4 days' residence time. Other experiments performed to show the influence of organic loading showed that increasing the organic material to microorganisms ratio decreases the removal efficiency. This study suggested the production of organic metabolic by-products. Cellosolve is biodegraded, but to products which in turn may be degraded at different rates or by different metabolic pathways from those utilized in cellosolve biodegradation.

REFERENCE: Journal WPCF, Vol. 54, No. 7, July 1982, pp. 1127-1130.

545. BIOPHYSICAL TREATMENT OF COKE PLANT WASTEWATERS

by

Gerald L. Bauer et al.

The activated sludge powdered activated carbon process (ASPAC) and the rotating biological contractor powdered activated carbon process (RBCPAC) were assessed and compared as to their efficiency in treating coke plant wastewaters. Constituents of the waste under concern included ammonia, cyanide, BOD and COD. Both methods controlled these substances to the satisfaction of proposed standards for coke wastewaters. Although meeting all restrictions, the RBCPAC process showed several strong disadvantages--inability to continue adequate nitrification under increased loading rates, the necessity of an extremely large land area and an significant cost difference as compared with the capital cost of the ASPAC process.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 332-342.

546. CATALYZED BIO-OXIDATION AND TERTIARY TREATMENT OF INTEGRATED TEXTILE WASTEWATERS

by

Alvin J. Snyder and Thomas A. Alspaugh

This report was conducted on the basis of a pilot plant operation that was conducted in order to upgrade the waste effluent found in an integrated textile dye mill. The pilot plant observation was used in order to activate carbon due to the fact carbon increases bio-degradation. Tertiary treatment was useful in conforming to submitted water standards. Attaining better water effluents were analyzed through two different methods. One including the addition of alum and alum recovery during the biological treatment plan. The quality of the effluents increased to a higher degree, but trace color was present in the supernatant. In order to improve the waste effluents, adsorbent resins were treated and found to have positive effects, which provided recreational standards. The data provided the information that carbon catalysis increased biological degradation and alum and resin systems caused a satisfactory tertiary treatment.

REFERENCE: Environmental Protection Technology Series, EPA-600/2-74-039, June 1974, pp. 1-83.

For articles on related subject see Nos. 49, 141, 142, 236, 237, 238, 239, and 240.

547. CHARACTERIZATION AND BIOLOGICAL TREATABILITY OF COAL CONVERSION WASTEWATERS

by

James C. Lamb, III et al.

Coal conversion wastewaters were characterized and a similar synthetic one formulated for testing purposes. Chemostats were tested over several time periods for TOC removal. Increased detention time was found to increase effluent quality. Other testing procedures are being used to test not only TOC, but COD and BOD as well. The treatment processes studied have lowered toxicity of the waste material with respect to living cells. Modified procedures now include the use of fresh sludge and the extended observation of chemical effects. Partial data is also given on the determination of design parameters.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 63-72.

For article on related subject see No. 143.

548. CHARACTERIZATION AND TREATMENT OF WASTEWATER FROM ARMY VEHICLE WASHRACKS

by

L. P. Furland and W. E. Schley

The wastewaters originating from military vehicle washracks were characterized from such agents as TSS, BOD_5, oil and grease, and pH. With this data, the design of a treatment system was begun. The process involved several different techniques, which included gravity settling, surface skimming, biological BOD treatment and coagulation by addition of alum. The system was designed to meet EPA and state health regulations and an attempt was made to utilize existing facilities.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 643-654.

549. CHARACTERIZATION OF EMISSIONS FROM THE DISPOSAL OF WOOD PRESERVING WASTES IN AN INDUSTRIAL BOILER

by

Richard S. Merrill et al.

The purpose of this paper is directed toward one disposal technique usable in wood preserving industries. Thermal destruction was the one technique discussed in the article.

Release from wood preserving waste is toxic. So, in working with the wastes, data was needed to know the material destroyed, form of the boiler, and both types of emissions rising from the process.

Analysis was made to see if the destruction and removal process was safe and accurate. Dioxins and Furan components of pentachlorophenol and gas from the stacks were all tested and checked for safety. Organic compounds were checked to make sure there were none being emitted from the industry.

REFERENCE: Annual Meeting of the American Institute of Chemical Engineers, New Orleans, Louisiana, November 10, 1981, pp. 1-33.

550. CHEMICAL/PHYSICAL AND BIOLOGICAL TREATMENT OF WOOL PROCESSING WASTES

by

L. T. Hatch et al.

A new method of treating wool-scouring wastewaters has been developed. The process involves a physical/chemical phase of high temperature acid-cracking in which the grease content is reduced 90%, biochemical oxygen demand is reduced 70%, and chemical oxygen demand is reduced 80%. The biological phase of the process consists of an extended activated sludge unit with 10 days' detention, which reduced the biochemical oxygen demand 83% and the chemical oxygen demand 54%. The settled effluent is then lagooned for 53 days in which the biochemical oxygen demand is reduced 56% and the chemical oxygen demand 54%. It was concluded that the period of aeration should be extended to 20 days and that sludge drying beds would be superior to lagooning.

REFERENCE: Environmental Protection Technology Series, EPA-660/2-73-036, January 1974, pp. 1-57.

For article on related subject see No. 51.

551. CHROMIUM DISPOSAL: TWO VARIATIONS

A system called the M & T process, which is a new chromium treatment technique, is described. Problems with conventional methods of treatment include the use of hazardous chemicals for chromium reduction and sludge disposal. The M & T process utilizes only non-toxic, non-corrosive chemicals and releases only a fraction of the amount of sludge produced by other methods. The initial difference of this technique from previously used ones is making hexavalent chromate insoluble without reducing it. The other variation in the system is the neutralization of the waste, while in its most concentrated form rather than in the rinse water.

REFERENCE: Industrial Water Engineering, Vol. 6, No. 6, June 1969, pp. 22-23.

552. COAL PREPARATION ENVIRONMENTAL ENGINEERING MANUAL

by

David C. NuneKamp

The manual provides an introduction to physical coal cleaning to individuals outside of the coal preparation industry. Specifically, the manual covers the general nature and characteristicsof the U.S. coals; provides an overview of the coal preparation plant; discusses the major equipment and processes currently in use in coal preparation; identifies the primary waste streams found during the coal cleaning operation; discusses the techniques of control currently applied to those waste streams; and describes the contaminant removal potential of coal.

REFERENCE: EPA, 600/2-76-138, May 1976, pp. 1-729.

553. COAL TO BURN?

by

T. G. Callcot

This paper examines the problem of whether or not coal has a technologically sound future, and also to show some of the ways in which the sceintific knowledge of coals ought to be developed, so considerable decisions by the government, utilities, and companies can be made at the right time. In coke-making, a new process to make ordinary blast-furnance coke, has been devised called the Auscoke process. The results show that the Auscoke process does make blast-furnance coke from poor to medium coking coals and can use a wide variety of blends. Another approach to gasification has come out of the problem providing a compact source of hot gas of the Auscoke shaft furnance. The new process is described as OXidation And Reforming of fuels, or OXAR. Energy is basic to all societies, and the importance of avoiding prodigal waste of fuels is now well appreciated far beyond the circles of fuel technologists. Coal is critical to the emergence of modern industries, although less readily used and modified than petroleums. The author suggests that coal science can be a useful science, and that it is best fostered in close association with industries.

REFERENCE: PACE, Vol. 31, No. 4, April 1978, pp. 9-19.

554. COMBINED BIOLOGICAL TREATMENT OF COKE-PLANT WASTEWATER AND BLAST-FURNACE RECYCLE-WATER SYSTEM BLOWDOWN

by

Joseph J. Gauthier et al.

Because of the production of several different types of wastewaters from integrated steel plants, the possibility of combined biological treatment was studied. The feasibility of the combined treatment of coke-plant wastewater and blast-furnace recycle-water system blowdown was shown to be positive and would result in an adequate reduction of ammonia. The combination of the two effluents would provide adequate floc formation for biomass settling and phenol to support heterotrophic bacterial growth. This method presents other advantages, such as providing some of the dilution water needed in the coke-wastewater treatment procedure as well as economic advantages in treating wastes in a single facility.

REFERENCE: Proceedings of the 36th Industrial Waste Conference, 1982.

For articles on related subject see Nos. 145, 247, 248, and 249.

555. COMPARATIVE PHYSICOCHEMICAL STUDY OF INDUSTRIAL WASTEWATER TREATMENT BY ELECTROLYTIC, DISPERSED AIR AND DISSOLVED AIR FLOTATION TECHNOLOGIES

by

Ernest R. Ramirez

This study consisted of conducting experiments, which would provide the data necessary for selecting the right type of flotation technology for a specific situation. The experiments study the use of electrolytic, dispersed air and dissolved air flotation. Pilot or beaker tests were shown to be a valuable information source prior to selection of one certain method. Various considerations must be made when analyzing these methods. These include initial cost, operation costs, and, of course, effectiveness. In some cases, a specific technique may actually enhance the treatment process in diverse ways, such as the electrolytic currents effect on coagulation properties of algae.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 699-709.

556. A COMPARISON OF COASTAL AND COMMON BERMUDAGRASSES (CYNODON DACTYLON (L.) PERS.) IN THE PIEDMONT REGION.
II. EFFECT OF FERTILIZATION AND CRIMSON CLOVER (TRIFOLIUM INCARNATUM) ON NITROGEN, PHOSPHORUS, AND POTASSIUM CONTENTS OF THE FORAGE

by

William E. Adams et al.

It has been found through testing that higher percentages of N, P, and K are contained in common bermudagrass grown with or without crimson clover as compared to coastal bermudagrass forage similarly fertilized. As more and more N was applied to the grass, ranging from approximately 1.6% N, with no N fertilization to 2.7% N at the 448-Kg/ha N rate, the nitrogen content of the grass forage was increased. By increasing levels of fertilization, the P and K contents of both grasses were increased. The N, P, and K contents of the grass forage were significantly higher in the July harvest than in adjacent harvests in June or August. In comparison to common bermudagrass, coastal bermudagrass recovered more nutrients from the soil, up to 86% of the applied N, up to 46% of the applied P, and as much as 191% of the applied K. The reason for more nutrient uptake by Coastal was because of higher yields obtained with the grass. By the use of fertilization, the P and K contents of crimson clover were significantly increased. In relation to crimson clover grown with Coastal bermudagrass, the K content of crimson clover grown with common bermudagrass proved to be higher.

REFERENCE: Agronomy Journal, Vol. 59, May/June 1967, pp. 281-284.

For article on related subject see No. 146.

557. COMPOSITION OF H-COAL ASPHALTENES: ACID-BASE SEPARATION AND OXIDATIVE DEGRADATION

by

Peter A. S. Smith et al.

This article deals with the interactions between salt-forming agents, such as dry hydrogen cloride, perchloric acids, and asphaltenes or pre-asphaltenes. Emphasis is towards improving the separations and fractionations of these asphaltenes and improving the purification of resulting salt precipitates.

REFERENCE: American Chem. Society, Division of Petroleum Chemistry, Vol. 24, No. 4, 1979, p. 974.

For articles on related subject see Nos. 251 and 252.

558. A COMPREHENSIVE STUDY OF THE BIOLOGICAL TREATABILITIES OF PHENOL AND METHANOL-I ANALYSIS OF BACTERIAL GROWTH AND SUBSTRATE REMOVAL KINETICS BY A STATISTICAL METHOD

by

Jung WK Kim et al.

This study developed a statistical model, which would accurately demonstrate bacterial growth and substrate removal kinetics. This model consisted of two equations with a third equation, which described the oxygen utilization rate based on substrate removal and growth kinetics. The parameters derived from the equations were evaluated as to their accuracy by comparison to experimental data. Using this type of statistical method displays a significant advantage over the conventional linear graphical method in that results are of unbiased nature.

REFERENCE: Water Research, Vol. 15, 1981, pp. 1221-1231.

559. A COMPREHENSIVE STUDY ON THE BIOLOGICAL TREATABILITIES ON PHENOL AND METHANOL-II THE EFFECTS OF TEMPERATURE, pH, SALINITY AND NUTRIENTS

by

Jung WK Kim and Neal E. Armstrong

An investigation was conducted over the temperature, pH, nutrients on bacterial activities, and salinity by using a statistical method. During pH deviation from neutral, the rate of coefficient (k) decreased. Salinity increased causing unfavorable pH and salinity alleviation to effect the temperature on potassium. A modified Arrhenius equation failed in being effective in describing the temperature range on potassium. Environmental factors such as pH, temperature, and salinity can affect the endogeneous respiration activity, as it did in this case. However, clay decay in the coefficient methanol and phenol sludge turned out to a single parameter, potassium. The pH in this instance was the main factor in affecting the decomposing rate in natural systems of normal cells. In phenol decomposition, water was the main factor where pH was decreased. Observation in 8 out of 115 phenol batch tests and 31 out of 66 methanol tests showed an initial log phase.

REFERENCE: Water Research, Vol. 15, 1981, pp. 1233-1247.

560. COST EFFECTIVENESS MODEL FOR POLLUTION CONTROL AT COKING FACILITIES

by

William F. Kemner

The report describes a computer model, developed for coking facilities, that allows the user to determine the optimum mix of pollution control devices to achieve a specified reduction in pollutant emission at the minimum annual capital cost. The computer calculates and displays the associated cost for each emission level in pounds of pollutant per ton of coal and tons of pollutant per year for the following four pollutant types: total suspended solids, benzene-soluble organics, benzo(a)pyrene, and benzene. The program can consider 20 emission sources and 9 control options for each emission source.

REFERENCE: EPA, 600/2-79-185, August 1979, pp. 1-297.

For articles on related subject see Nos. 149, 257, 258, and 467.

561. CRYSTALLINE VITAMINE B_{12}

by

Edward L. Rickes et al.

Crystalline vitamin B_{12}, which was isolated from liver, has been found to be an effective treatment for addisonian pernicious amenia. After drying, the compound crystallizes into small red needles, which darken to black at 210-220°. The potency of the compound is about 11,000,000 LLD units/mg and the recommended dosage is 20-60 micrograms. Commerical liver extracts were tested to determine their vitamin B_{12} content.

REFERENCE: Science, Vol. 107, April 16, 1948, pp. 396-397.

For articles on related subject see Nos. 151 and 259.

562. DESIGN OF AN ACTIVATED CARBON SYSTEM FOR WOOD PRESERVING WASTES

by

Robert F. Pence and Tom D. Reynolds

The use of an activated carbon system was investigated for its use as a secondary treatment process for wood preserving wastes. Parameters used in the project design were determined from equilibrium and laboratory column break-through tests. This method may be feasible in plants not having an available municipal treatment system, plants having small carbon requirements or in plants large enough to justify carbon regeneration. Carbon requirements are relatively high in most cases, but may be alleviated in light of the highly concentrated waste being treated.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 33-38.

For articles on related subject see Nos. 152, 261, 268, and 471.

563. DETERMINATION OF OIL CONTENT OF OIL CONTAMINATED SOIL

by

W. B. McGill and M. J. Rowell

Methylene chloride, an oil extractant, can be used to measure the oil content of soil contaminated by oil spillate. The method in this article works well on both mineral and organic soils.

REFERENCE: Science of the Total Environment, Vol. 14, 1980, pp. 245-253.

564. DETERMINATION OF PENTACHLOROPHENOL IN HARDWOOD CHIPS

by

Floyd R. Fullerton et al.

This paper described a method of determining pentachlorophenol (PCP) content in cardboard and hardwood chips. This study was concerned with developing a method which was both more rapid as well as more sensitive to (PCP). In a series of tests using several different concentrations of PCP, quantitative recovery amounts were determined. Initial tests displayed the high sensitivity of this technique, and repeated testing showed the reproducibility of similar results.

REFERENCE: Journal Agricultural, Vol. 30, No. 6, 1982, pp. 1117-1119.

565. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE GUM AND WOOD CHEMICALS MANUFACTURING

by

Robert B. Schaffer et al.

An extensive study has been done concerning gum and wood chemicals in search of the purpose of effluent limitations, performance for new materials, and pretreatment standards in certain sections of the Clean Water Act. In this particular study, an estimate of 119 gum and wood chemicals were focused on and some 7 were affected by the findings. Limitations on effluents were given guidelines and then set up with a degree of effluent reduction available by additions of the best practicable control technology presently available for a new subcategory, Sulfate Turpentine processing. The guidelines were established for the reason that a certain level of effluent reduction would be attainable through application of (BAT). This is the best available technology and can be achieved economically. The best conventioned pollutant control technology is (BCT). New sources with standard performance were set forth for a degree of effluent reduction that can be reached by applying the best available demonstrated control technology, operating methods, processes, and other selections. Existing and new sources have pretreatment standards (PSES and PSNS) set up so the level of effluent reduction that must be reached in order to prevent any discharge of pollutants that interfere, pass through, or are imcompatible with the POTW operation. BPT for Sulfate Turpentine and BPT are established on the same form of regulation by deriving at the same methodology. BCT regulations were based on the best practicable control technology. BAT and NSPS were also derived on practicable control technology and additional removal of metals at-the-source where the metals were being used as catalysts. PSES and PSNS are being considered for metal removal as a proposed regulation when metals are being used as catalysts. Informative data, methods for development and rationale for proposed effluent limitation standards of performance and guidelines are within this document.

REFERENCE: EPA, 440/1-79/078-b, December 1979, pp. 1-246.

566. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE INK FORMULATING

by

Effluent Guidelines Division

This document presents the findings of an extensive study of the ink manufacturing industry for the purpose of developing effluent limitations for existing point sources and standards of performance for new sources and pretreatment standards for existing and new sources to implement Sections 301, 304, 306, and 307 of the Clean Water Act. The study covers approximately 460 ink manufacturing facilities in SIC Group 2893.

Effluent limitation guidelines are set forth for the degree of effluent pollutant reduction attainable through application of best available technology economically achievable which must be attained by existing point sources by July 1, 1984. The standards of performance for new sources (NSPS) set forth the degree of effluent pollutant reduction that is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives. Pretreatment standards for existing and new sources (PSES and PSNS) set forth the degree of effluent pollutant reduction that must be achieved in order to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTW.

The proposed regulations for BAT, NSPS, PSES and PSNS are based on application of contract hauling to completely eliminate the discharge of pollutants from ink plants.

Supportive data, rationale, and methods of the proposed effluent limitation guidelines and standards of performance are contained in this document.

REFERENCE: EPA, 440/1-79/090-b, December 1979.

567. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE METAL FINISHING

by

Effluent Guidelines Division

The Metal Finishing Category (MFC) encompasses 44 unit operations involved in the machining, fabrication and finishing of products in SIC groups 34 through 39. The effluent guidelines for the Metal Finishing Category were developed from data obtained from previous EPA studies, literature searches, and plant surveys and evaluations. Initially, all existing infomation from EPA records and data from literature searches were collected. This information was then compiled in a format that summarized the individual plant descriptions for the following information: manufacturing unit operations performed, water usage, process water discharges, wastewater treatment practices, and wastewater constituents.

REFERENCE: EPA, 440-1-80-091-A, June 1980.

568. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE PAINT FORMULATING

by

Robert B. Schaffer et al.

This document presents the findings of an extensive study of the paint manufacturing industry for the purpose of developing effluent limitations for existing point sources and standards of performance for new sources and pretreatment standards for existing and new sources to implement Setions 301, 304, 306 and 307 of the Clean Water Act. The study covers approximately 1500 paint manufacturing facilities in SIC Group 2851. Effluent limitation guidelines are set forth for the degree of effluent pollutant reduction attainable through application of best available technology economically achievable which must be attained by existing point sources by July 1, 1984. The standards of performance for new sources (NSPS) set forth the degree of effluent pollutant reduction that is achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives. Pretreatment standards for existing and new sources (PSES and PSNS) set forth the degree of effluent pollutant reduction that must be achieved in order to prevent the discharge of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTW. The proposed regulations for BAT, NSPS, PSES and PSNS are based on application of water use reduction, recycle of rinse water, and/or contract hauling to completely eliminate the discharge of pollutants from paint plants. Supportive data, rationale, and methods of the proposed effluent limitation guidelines and standards of performance are contained in this document.

REFERENCE: EPA, 440/1-79/049-b, December 1979, pp. 1-469.

569. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE PETROLEUM REFINING

by

Effluent Guidelines Division

This development document presents the technical data base developed by EPA to support effluent limitations guidelines for the petroleum refining point source category. Technologies to achieve these limitations are defined as best available technology economically achievable (BAT), best conventional pollutant control technology (BCT), and best available demonstrated technology (BADT). This document outlines the technology options considered and the rationale for selecting each technology level. These technology levels are the basis for the proposed effluent limitations.

The rationale by which the Agency selected the technology option for each of the proposed effluent limitations guidelines is presented in Sections VIII, IX, X, and XI. Effluent limitations guidelines based on the application of BAT and BCT are to be achieved by direct dischargers by July 1, 1984. New source performance standards (NSPS) based on BADT are to be achieved by new facilities. Pretreatment standards for both existing sources (PSES) and new sources (PSNS) (based on application of BAT to those pollutants which are incompatible with a POTW) are to be achieved by indirect dischargers. These effluent limitations guidelines and standards are required by sections 301, 304, and 307 of the Clean Water Act of 1977 (P.L. 95-217).

The petroleum refining industry discharges significant quantities of toxic, conventional, and non-conventional pollutants. The Agency is proposing to control the toxic pollutants chromium (both total and hexavalent) and phenol (total 4AAP); and the conventional pollutants oil and grease, total suspended solids (TSS), and biochemical oxygen demand (BOD). Non-conventional pollutants such as ammonia, sulfite, and chemical oxygen demand (COD) are also regulated under existing BPT.

EPA is proposing BAT effluent limitations based on reduced flow through greater recycle and reuse of wastewaters; or based on the use of powdered activated carbon and/or rotating biological contractors as pretreatment before BPT. Table I-1 lists these limitations.

EPA is proposing BCT effluent limitations based on BAT technology. These limitations are listed in Table I-2.

For NSPS, EPA is proposing to prohibit the discharge of pollutants to navigable waters. This standard is based on existing industry practice at exemplary facilities and demonstrated technologies.

EPA is proposing PSNS and PSES based on removal of metals and existing PSES control technology for oil and grease and ammonia. Table I-3 lists these limitations.

EPA also is proposing separate PSES and PSNS for those refineries discharging into a POTW which has received a waiver under Section 301(h) of the Clean Water Act of 1977. Such waivers would exempt POTW's from achieving effluent limitations based on secondary treatment. These pretreatment standards are listed in Table I-4 and are based on the same technology as that for the proposed BAT guidelines. These standards, however, set explicit numerical values on the concentration of regulated pollutants. Informational mass limitations are also provided for POTWs wishing to limit total mass discharge.

EPA estimates the annual costs for the petroelum refining industry to comply with the proposed regulation to be $53.9 million.

REFERENCE: EPA,440/1-79/014-b, December 1979.

570. DEVELOPMENT DOCUMENT FOR INTERIM FINAL EFFLUENT LIMITATIONS GUIDELINES AND PROPOSED NEW SOURCE PERFORMANCE STANDARDS FOR THE PHARMACEUTICAL MANUFACTURING

by

Effluent Guidelines Division

This document presents the findings of a study of the pharmaceutical manufacturing point source category for the purpose of developing effluent limitations and guidelines for existing point sources plus standards of performance and pretreatment standards for existing and new source, to implement Sections 301(b), 301(c), 304(b), 304(c), 306(b), 306(c), 307(b) and 307(c) of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, 1311, 1314(b), 1314(c), 1316(b), 1317(b) and 1317(c), 86 Stat. 816 et. seq.) (the "Act").

Effluent limitations and guidelines contained herein set forth the degree of effluent reduction attainable through the application of the Best Practicable Control Technology Currently Available (BPT) and the degree of effluent reduction attainable through the application of the Best Available Technology Economically Achievable (BAT) which must be achieved by existing point sources by July 1, 1977, and July 1, 1983, respectively. The standards of performance and pretreatment standards for existing and new sources contained herein set forth the degree of effluent reduction which is achievable through the application of and Best Available Demonstrated Control Technology, processes, operating methods, or other alternatives.

The development of data and recommendations in the document relate to the pharmaceutical manufacturing industry, which is one of eight industrial segments of the miscellaneous chemicals industry. Effluent limitations were developed for each subcategory covering the pharmaceutical manufacturing point source category on the basis of the level of raw waste load as well as on the degree of treatment achievable by suggested model systems. These systems include biological and physical/chemical treatment and systems for reduction in pollutant loads.

Supporting data and rationale for development of the proposed effluent limitations, guidelines and standards of performance are contained in this report.

REFERENCE: EPA, 440/1-75/060, December 1976.

571. THE DEVELOPMENT OF AN ACTIVATED CARBON ADSORPTION PROCESS FOR THE TREATMENT OF CADMIUM(II)-PLATING WASTEWATER

by

C. P. Huang, P. K. Wirth

This paper looks at a study of an activated carbon adsorption process. The process was developed for the treatment of cadmium plating wastewater. A total of 15 activated carbons were tested. Of the 15 tested, the results showed that powdered activated carbons generally have a better Cd(II) removal capacity than the granular carbons, at least below acidic or neutral pH conditions. A suspension-polymerization technique was tried to mount up to one of the powdered activated carbons, Nuchar SA, to sizes adequate for column packing. H_2SO_4, HCl, and $HClO_4$, strong acids, were tried to regenerate the Cd (II)-laden activated carbon beads.

REFERENCE: Heavy Metal Environmental International Conference, 3rd, 1981, pp. 100-103.

572. DISPOSAL OF CONTAMINANTS AND WASTES FROM BY-PRODUCTS OF COAL CARBONIZATION INDUSTRY--PROBLEMS AND PROSPECTS

by

B. P. Das et al.

This paper reviews the pollution problem similar to the coal carbonization industry, available methods of treatment of wastes, and also developmental work for their proper disposal. A problem exists from the disposal of wastes from coal carbonation by-products, which could be minimized by the recovery of useful industrial products and chemicals. The chemicals and products recovered can be used as feedstock for chemical and allied industries. The many types of wastes, their sources, quantity, and nature are studied in this paper, and also a look is taken at the present industrial practice, and the R & D activities in the field are studied. Some of the promising developments have possibilities of application and are shown in text of Indian industries.

REFERENCE: Chemical Economy & Engineering Review, Vol. 14, No. 7-8, July/August 1982, pp. 13-19.

For articles on related subject see Nos. 14 and 155.

573. DISPOSAL OF NITROGENOUS LIQUID EFFLUENT FROM MODDERFONTEIN DYNAMITE FACTORY

by

N. A. Lever

Nitrogenous effluent has been disposed of as a liquid fertilizer on pasture land and hay crops. Its effects on the application sites were found to be satisfactory. When the effluent was applied to crops grown on fertile soil, a highly desirable fodder was produced. The only adverse effect found of nitrogen applications was nitrogen poisoning; however, concentrations of the effluent in this study were not high enough to cause such a problem. Although no deleterious effects have been found, it is believed that applications of potash, phosphate, and magnesium may be used to supplement the effluent.

REFERENCE: Proceedings of the 21st Industrial Waste Conference, Purdue University, Vol. 121, 1966, pp. 902-925

574. DISPOSAL OF TREATED AND UNTREATED ELECTROPLATING WASTE IN AN SIMULATED MUNICIPAL LANDFILL

by

Larry W. Jones and Philip G. Malone

This experiment examined the possibility of adding one part electroplating waste (EPW) to four parts municipal solid waste (MSW) before disposal of a municipal landfill. Applications of deionized water were used to simulate rainfall and predict leachate compositions. Leachate analysis showed lower concentrations of cadmium, chromium, copper, lead, manganese, zinc, and chloride when EPW was present in the waste. Tests were conducted on both treated and untreated EPW with no significant difference in the amount of hazardous material lost due to leaching in either case. The untreated waste did tend to raise the pH slightly more than the presence of treated or no EPW.

REFERENCE: Land Disposal of Hazardous Waste, Proceedings of the 8th Annual Research Symposium, EPA 600/9-82002, March 1982, pp. 294-314.

575. DURA-TREET I
A NEW, COMPLETELY WATER-BORNE PENTACHLOROPHENOL PROCESS

by

David B. Hatcher

Idacon's patented method involves pressure treating wood in a negative hydrocarbon for pentachlorophenol. The method has been done in a water-borne system, which includes a process to solublize the pentachlorophenol. Alkaline solution such as a sodium, potassium, calcium, or ammonium salt are used in the solubilizing process. The wood is treated with injections of clear organic ester, and following a period of time, there is a reaction. Deposits of non-leaching pentachlorophenol in the cell wall are part of this reaction. Treated wood has characteristics of being light (color/weight), paintable, and glues as well as other wood untreated. There are no discharges in the environment due to the water in the treating cylinder and "kickbacks" can be recycled.

REFERENCE: Proceedings of the 77th American Wood-Preservers' Association, Vol. 28, No. 11, 1981, pp. 89-97

For articles on related subject see Nos. 15, 157, and 476.

576. DURA-TREET II, A WATER DISPERSIBLE PENTACHLOROPHENOL

by

David B. Hatcher

This report deals with a water dispersible pentachlorophenol, wood treatment; comparisons with standard treatments, and environmental aspects are discussed such as leaching, soil-block tests, results of electron microscope and micrograph investigation, and element mapping by x-ray photograph. Tests to evaluate its commercial use are also reported on.

REFERENCE: Proceedings of the 76th Annual Meeting of American Wood-Preservers' Association, Vol. 76, 1980, pp. 308-320.

577. THE EFFECTS OF BIOCIDAL TREATMENTS ON METABOLISM IN SOIL-- I. FUMIGATION WITH CHLOROFORM

by

D. S. Jenkinson and D. S. Powlson

This study was performed over the effect biocidal conditions would have on the metabolism of soil. A flush system was designed to stimulate decomposition and soil biomass. Fumigated soil by chloroform caused increases in the ammonium and organics. This soil was then under incubation for a period of 10 days. Nitrogen and oxygen were often increased more in the fumigated rather than the unfumigated soils. Following fumigation, a flush did not increase unless the soil was ever in incubation. However, the second flush never increased over one-seventh the size of the first. Results stipulate decomposition after the flush comes from organisms already broken down. This leads to the fact that 10% of the glucose carbon was in the soil biomass in the first place.

REFERENCE: Soil Biol. Biochem., Vol. 8, 1976, pp. 167-177

For articles on related subject see Nos. 16, 26, 27, 160, 162, 164, 165, 272, 275, 276, 278, 280, 284, 286, 287, 288, and 289.

578. THE EFFECTS OF BIOCIDAL TREATMENTS ON METABOLISM IN SOIL--VI.

by

V. N. Kudeyarov and D. S. Jenkinson

The use of carbon disulfide as a soil fumigant was studied and compared to the effectiveness of $CHCl_3$. Carbon disulfide exhibited very similar characteristics for use in measuring biomass other than it is consistently less efficient to a small degree. High carbon disulfide concentrations for nitrification inhibition results in increased nitrogen mineralization. Lower concentrations were shown to cause inhibition with essentially no other effects on the soil unless in soils with low organic content. In this case, nitrogen mineralization and soil respiration were both increased.

REFERENCE: Soil Bio. Biochem., Vol. 8, December 20, 1975, pp. 375-378.

579. EFFECTS OF WATER POLLUTED BY OIL ON AQUATIC ANIMALS II. N-PARAFFINS, AROMATIC HYDROCARBONS AND CRUDE OIL CONCENTRATION ON TAINT IN SCALLOP (PECTEN YESSOENSIS)

by

Terushige Motohiro and Zensuke Iseya

The adductor muscle of scallops was analyzed by organoleptic testing by the addition of several types of quantities of hydrocarbons. Tests were to determine the type and amount of hydrocarbons, which may cause tainting of the scallop muscle. Tested concentrations of n-tetradecane and n-hexadecane caused no detrimental effects to the scallop. Substances found to cause tainting to a more significant degree included crude oil, xylene, toluene and mixtures of hydrocarbons.

REFERENCE: Bull. Fac. Fish. Hokkaido Univ., Vol. 26, No. 4, 1976, pp. 367-371.

For articles on related subject see Nos. 290, 291, 292, 293, and 294.

580. EFFLUENT PROBLEMS AND MATERIAL RECOVERY IN THE ELECTROPLATING INDUSTRY

by

R. Pinner

This report discusses the metal electroplating industry in general as to its waste production, treatment, and cost. Tables are given showing metal and water consumption, metal concentrations, effluent discharge of one system and average cost of several treatment systems. The paper briefly discusses restrictions of type and amount of discharged effluent. A number of aspects of different treatment systems are then mentioned which are associated with metal recovery, concentration of rinse water and sludge disposal. Finally, methods of increasing efficiency are reviewed, such as recovery of non-metals and excess water. These considerations are made primarily for operation cost reduction.

REFERENCE: Product Finishing, Vol. 28, No. 11, November 1975, pp. 26-33.

581. ELECTROPLATING EFFLUENT CONTROL--PART 2

by

Dr. C. A. Smith

Several methods or phases of electroplating effluent treatment are explained. Methods for reducing contaminants in rinse water were evaporative recovery, climbing film evaporators and flash evaporators. In most cases, additional treatment following these mentioned will be necessary. These secondary treatment methods were categorized under "batch treatment" and "continuous flow treatment" systems. When the electroplating effluent must attain lower levels of suspended solid, techniques such as filtration or an integrated treatment system may be used. The report then briefly discussed the construction of various waste treatment facilities.

REFERENCE: Water Services, February 1980, pp. 92-94.

582. ELECTROPLATING WASTE WATER SLUDGE CHARACTERIZATION

by

CENTEC Corporation, Reston, VA

EPA's RCRA regulations have provisions, the Extraction Procedure (EP), for evaluating the hazardous nature of certain materials. This test method was evaluated by EPA and the American Electroplaters' Society and applied to metal finishing sludges. Concurrently, tests to chemically and physically characterize the sludges were performed. This report provides an evaluation of the leachability of metal finishing sludges tested according to the EPA's Extraction Procedure (EP). The results showed that many sludges were disposed segragated from acidic environments. However, when tested by the EP, many were found to leach excessively. This is partly an artifact of the test procedure, but does indicate that basic sludges will redissolve in acidic environments. Questions should be directed to the Nonferrous Metals and Minerals Branch of the Industrial Environmental Research Laboratory.

REFERENCE: EPA 600/2-81-064, April 1981, pp. 1-85.

583. ELECTROPLATING WASTES: HISTORY & CURRENT STATUS

An extensive history of pollution control is illustrated in this article; from the time when control was totally voluntary, to the present with strict regulations on wastes to future legislation. Emphasis is placed upon the neutralization of cyanide and the separation of metals. Regulatory pressures have improved upon the conventional techniques. There are, in general, four new techniques--improved ion exchange resins, better evaporation techniques, improved precipitants for metals, and membrane process.

Ion exchange has been used to recover metals for around 25 years. Several variations of traditional ion exchange techniques are described within the article. Improvements in evaporation techniques are also described. Solubility improvements have caused changes in precipitation methods. Membrane processes discussed included ultrafiltration, reverse osmosis, electrodialysis, and Donnan dialysis.

REFERENCE: Industrial Finishing, Vol. 57, No. 11, November 1981, pp. 14-17.

584. EMISSIONS AND RESIDUE VALUES FROM WASTE DISPOSAL DURING WOOD PRESERVING

by

B. DaRos et al.

Agency restrictions on the discharge of wastewater generated during the preservation of wood has resulted in the increased use of evaporation techniques for water removal by the wood preserving industry. This report, which further details the type of work described in EPA report 600/2-81-066 "Wood Preserving Industry Multimedia Emission Inventory " discusses emissions and residues that were measured during thermal (pan) evaporation, spray pond evaporation, and direct thermal destruction of organic components in the wastewater. The information presented includes plant and evaporation device descriptions, wastewater and residue handling procedures, sampling and analytical results, and conclusions and recommendations. Also presented are qualitative descriptions of the fugitive emissions and residues that occur during normal processing operations.

It was concluded that toxic materials are both emitted and disposed as residues. This includes organic compounds (phenols and polynuclear aromatic hydrocarbons) that were emitted to the atmosphere during thermal (pan) evaporation. Similar organic emissions from the spray pond were below detectable levels. Contrarily, solid residues from evaporators had low concentrations of toxic organic constituents, while residues in spray ponds contained much higher levels than the feed wastewater. Fugitive organic emissions from the retort and vacuum vents were highly concentrated although limited in duration. Thermal destruction of wastewater sludge by cofiring in an industrial wood-fired boiler was 96.1 to 99.99+ percent complete for the measured organics. Chlorinated dioxin and furan components were measured in both sludge and ash wastes, but varied too much to determine removal or generation rates.

Sludges produced from each process contained a significant toxic organic fraction. Waste sludge must be recycled back to the process for reuse or disposed in a manner cognizant of the toxic components indentified.

REFERENCE: EPA-600/S2-82-062, August 1982, pp. 1-6.

585. ENHANCED BIOLOGICAL TREATMENT SYSTEM FOR COKE PLANT WASTEWATER ACHIEVING COMPLETE NITRIFICATION

by

A. Bhattacharyya and A. C. Middleton

This paper describes a bench-scale treatability study, which showed adequate nitrification of coke plant wastewater. This method is based on the Best Available Technology Economically Achievable (BATEA). One alternative is a physicochemical process, which is highly effective; however, it normally entails high operation costs. Biological treatment, when applicable, demonstrates a more desirable technique. Acceptable nitrification was achieved by filtration and dephenolization of ammonia liquor followed by steam distillation with soda ash and also by the use of activated sludge technology. The system also achieves high ammonia, phenol, thiocyanate and thiosulfate treatment of these wastes.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 354-372.

586. ENVIRONMENTAL ASSESSMENT OF COKE BY-PRODUCT RECOVERY PLANTS

by

D. W. Van Osdell et al.

The report gives results of an initial screening study, initiating a multimedia environmental assessment of coke by-product recovery plants in the U.S. The study included both the gathering and analysis of existing data and sampling and analysis at one plant based on EPA's Industrial Environmental Research Laboratory RTP Level 1 protocol. Process data concerning design and operation of existing plants and processes were examined. Many variations of all process types exist, forcing an examination of the industry to determine the commoner processes. Sampling and analysis utilized a basic EPA Level 1 format, tailored for organic vapor sampling. Specific samples were also analyzed for cyanide. Air was sampled at all suspected pollution sources, most of them storage tanks. The largest single source was the final cooler cooling tower--aromatics at > 50 g/Mg coke and cyanide at 278 g/Mg coke were both significant. Polynuclear aromatic hydrocarbon (PAH) compounds were indicated, but not quantified. Concentrations of pollutants in the vapor above storage tanks were measured, but actual emission rates were not determined because of the difficulty in measuring working and breathing losses for the tanks sampled. Water sampling data from the same plant, developed by EPA's Effluent Guidelines Division, were included in the over all study analysis.

REFERENCE: EPA 600/2-79-016, January 1979, pp. 1-389.

587. ENVIRONMENTAL ASSESSMENT OF DRY COKE QUENCHING VS CONTINOUS WET QUENCHING

by

C. W. Westbrook and D. W. Coy

The report gives results of an assessment of the multimedia environmental of continous wet and dry quenching at National Steels' Weirton, West Virginia, Brown's Island coke plant. The report, based primarily on design data, tests data from related processes, and engineering judgement, suffers from the lack of definitive test data. The assessment indicates that dry coke quenching results in less particulate matter emitted, less solid waste generated, less process-related gas emitted, and potentially less emission of polynuclear aromatic hydrocarbons and organics in general, than wet quenching. Dry coke quenching also results in increased aqueous effluents and fugitive emissions from coke transport and screening. The assessment concludes that, with proper wastewater treatment and control of coke transport emissions, the dry quench process should have less negative environmental impact than continous wet quenching. The report identifies areas where data are insufficient for Level 1 assessment and indicates the testing required for a complete Level 1 assessment.

REFERENCE: EPA 600/2-80-106, May 1980, pp. 1-38

588. EVALUATION OF PASSIVE MONITORS FOR ASSESSING VAPOR DEGREASER EMISSIONS

by

J. F. Mazur et al.

This report discussed passive monitors and their effectiveness in collecting airborne vapor degreasing solvents. One stage of the experiment determined collection efficiencies for methyl chloroform and trichloroethylene under laboratory conditions. The utilization of static chambers determined standard atmospheres at various solvent concentrations. The last part of the experiment monitored several solvent vapor degreaser systems in actual use. This provided a useful comparison to the laboratory finding and to the previously used charcoal tube sampler method.

REFERENCE: American Ind. Hygiene Association Journal, Vol. 42, October 1981, pp. 752-756.

589. EVAPORATION RECOVERY OF CHROMIUM PLATING RINSE WATER

by

L. N. Elicker

This paper concentrates on providing more thorough performance and economic information on a new evaporative approach for recovering chemicals and refining chromic acid rinse waters for reuse. The study proved the economic soundness of an evaporative recovery system for waste waters, and the project also showed that the effluent from plating rinse dragout can be practically disregarded. It pertains only to decorative chromium operations, even though other electroplating solutions are currently being recycled successfully.

REFERENCE: Finishing Industries, Vol. 2, No. 11, November 1978, pp. 28-32.

590. EVAPORATIVE RECOVERY SYSTEM CUTS CHROME CONSUMPTION 70%

This climbing film evaporator system recovers 95% of chromic acid once lost in waste and used in conjunction with cation exchange; the chromic acid content in the effluent is almost zero. The evaporator also recovers a proprietary foam depressant for re-use.

REFERENCE: Industrial Finishing, Vol. 52, No. 5, May 1976, pp. 42-44.

591. FATE AND IMPACT OF WOOD PRESERVATIVES IN A TERRESTRIAL MICROCOSM

by

Jay D. Gile et al.

Creosote, containing either phenanthrene or acenaphthene, pentachlorophenol and bis(tri-n-butyltin) oxide, which was present in treated wood posts, was examined as to its affect on the environment. This preservative was compared to dieldrin, an insecticide, in a microcosm containing topsoil, plant and animal life. The majority of perservative released into the soil remained in the close proximity of the posts. Concentrations in plant and animal life were determined, but varied widely. Only a small percentage of creosote escaped from the posts during the period of time studied. No adverse affects were shown from this while some toxicity was seen in crickets containing dieldrin concentrations.

REFERENCE: Journal of Agri. Food Chem., Vol. 30, No. 2, 1982, pp. 295-301.

For articles on related subject see Nos. 170, 171, 172, 173.

592. FATE OF BASIC POLLUTANTS IN TREATMENT OF COKE-PLANT EFFLUENTS

by

J. J. Ganczarczyk

This paper examines new information on coke-plant effluents treatment in laboratory, pilot-scale and full-scale, to support other available data on the subject. The study is directed to facilitate the selection of treatment methods and treatment strategy for the specific treatment requirements. A table presented in the study shows a range of component concentrations describing typical coke-plant effluents. Usual treatment of coke-plant effluents is capable of removing from the wastewater the basic pollutants, such as phenolics cyanide thiocyanate, and ammonia, but the residual concentrations of some of the analytical indicators may be higher than some concentrations. The state of residual organic substances in conventionally-treated coke-plant effluents should be a subject of further studies, because they show noticeable quantities of carcinogenous polycyclic aromatic hydrocarbons. The paper concludes that analytical methods used to show coke-plant effluents and to control treatment of this wastewater are to a large extent insufficient and often produce questionable data.

REFERNECE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 325-331.

For article on related subject see No. 29.

593. THE 15 MILLION DOLLARS NICKEL PLATERS WASTE

by

Conrad A. Berube

Electroplating of nickel uses 35 million pounds of nickel and costs 100 million dollars a year when additive chemical costs are added to the cost of metal alone. Fifteen million dollars could be saved from this 100 million dollar cost by using the proper process, evaluating the cost effectiveness of additives used, maximizing the useful life of additives, using cost saving processes, and adhering to optimum conditions of additive use without lowering the quality of plating desired.

REFERENCE: Products Finishing, Vol. 40, No. 9, June 1976, pp. 50-53.

For articles on related subject see Nos. 71 and 305.

594. FORD ENGINEERS SELECT KEY DESIGN FEATURES OF SUCCESSFUL ACID ETCH, NICKEL, AND CHROME RECOVERY SYSTEMS

by

Betty A. Rose

Ford Motor Company's Saline Instrument and Plastics plant is the world's largest injection molding plant. Two chrome plating lines utilize massive amounts of chemicals and recovery chromic acid etch, nickel, and decorative chrome.

Three design considerations discussed are concerned with rinse flow rates, rinse concentration, and impurities. The main topics discussed in this article are: 1. the plating process, 2. acid etch recovery, 3. chromic acid regeneration, 4. nickel recovery, 5. decorative chrome recovery, and 6. maintenance and operation.

REFERENCE: Industrial Finishing, Vol. 55, No. 5, May 1979, pp. 44-47.

For articles on related subject see Nos. 72, 174, 306, and 484.

595. FORD MOTOR COMPANY BY-PRODUCT COKE PLANT

by

Charles E. Sponagle

A survey of process wastes resulting from operation of the Ford Motor Company Coke Plant at Dearborn, Michigan, was undertaken by the Environmental Health Center, Public Health Service, with the cooperation of the Ford Motor Company. The survey covered the period from October 23 through November 3, 1949 and was carried out for the purpose of collecting detailed information regarding the wastes produced by this plant. Coal was carbonized in coke ovens for production of blast furnance and foundry coke. Coking conditions during this survey were abnormal in that coking temperatures for production of blast furnance coke were from 350-400°F. lower than normal, while coking time had been doubled. This was necessitated by a coal shortage due to a strike in the coal fields. Gas and liquor evolved in the process are treated for recovery of by-products, which include ammonium sulfate, naphthalene, tar and light oils. Following by-product recovery, coke-oven gas is stored and used for various purposes in the plant. Principal process wastes are from the ammonia stills and final coolers. There is some liquid discharge from the decanters in the light oil plant, but only a very small volume comes from these units. Unit values of major constituents of wastes were found to be: Phenol, 0.30 lb/ton coal carbonized; ammonia 0.44 lb/ton coal carbonized; cyanide 0.55 lb/ton coal carbonized; 5-day BOD 9.1 lb/ton coal carbonized. The waste flow per ton of coal carbonized was 2420 gal. from the final coolers, and 31.8 gal. from the ammonia still. The amount of coal carbonized varied from 2130 to 2309 tons per day, and averaged 2233 tons per day. Results obtained from this survey are compared with those of a previous survey undertaken in 1947, when plant operation was normal. The 1947 survey disclosed unit waste discharge to be: Phenol, 0.14 lb/ton coal carbonized; cyanide, 0.76 lb/ton coal carbonized; 5-day BOD, 6.1 lb/ton coal carbonized. Waste disposal is by dilution in the Rouge River through the tailrace outlet.

REFERENCE: EPA, PB 230 082, November 1949, pp. 1-39.

596. GAS-LIQUID EQUILIBRIUM OF CARBON DIOXIDE PLUS M-CRESOL AND CARBON DIOXIDE PLUS QUINOLINE AT ELEVATED TEMPERATURES

by

Herbert M. Sebastian et al.

This paper studies the vapor and liquid equilibrium phase compositions for two binary systems--CO_2 plus m-cresol and CO_2 plus quinoline at temperatures up to 430°C in the pressure range 20-50 atm. In one experiment, the temperatures of CO_2 plus m-cresol mixtures were 189.9-391.5°C. In the second experiment, the temperature was 188.6-430.2°C and pressures up to 50 atm. For both of the resutls, a flow apparatus was used.

REFERENCE: Journal of Chemical and Engineering Data, Vol. 25, No. 2, 1980, pp. 381-383.

For article on related subject see No. 308.

597. AN IMPROVED BISMUTH PLATING PROCESS

by

W. Dingley et al.

The plating electrolytes in this research were unstable chemically during the plating. Electrolytes were then modified to produce composition and surface pretreatment and produced stable electrolytes, which obtained bright, dense and adherent deposits on copper and copper-coated steel. Optimum results were taken from the electrolyte that had 15 g/l bismuth, 180 g/l hydrochloric acid, 5 g/l gelatin, 52 g/l ammonium hydroxide and sufficient sodium hydroxide to adjust the pH value to 0.36. The best range for a dependent pH electrolyte was between 0.20 to 0.36. The high deposits of bismuth were produced on copper at a thickness up to 0.127 mm in a density range of 2.2 to 3.2 A/dm^2. The pretreatment was a pickling solution containing nitric, phosphoric and acetic acids.

REFERENCE: Plating and Surface Finishing, April 1976, pp. 26-33.

For articles on related subject see Nos. 175, 312, 313, 314, 316, 322, and 437.

598. INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 6. THE INDUSTRIAL ORGANIC CHEMICALS INDUSTRY

by

Raimond Liepins et al.

The catalog of Industrial Process Profiles for Environmental Use was developed as an aid in defining the environmental impacts of industrial activity in the United States. Entries for cash industry are in consistent format and form separate chapters of the study. Industrial organic chemicals are the product of at least one chemical reaction in this industry and will undergo at least one additional treatment step in a downstream processing industry. These compounds are intermediate materials in the manufacture of such products as plastics, synthetic fibers, pharmaceuticals and surfactants among others. The industry is discussed in terms of ten feedstock groups: benzene, butylene, sources of cresylic acids, ethylene, methane, naphthalene, paraffins, propylene, toluene and xylenes. Ten chemical trees, ten process flow sheets and 365 process descriptions have been prepared to characterize the industry. Within each process description available data have been presented on function, input materials, operating parameters, utilities, waste streams, EPA Source Classification Code and references. Data related to the subject matter, including company, produce and raw materials data are included as appendices.

REFERENCE: Environmental Protection Technology Series, EPA-600/2-77-0231, February 1977, pp. 6-001 - 6-992.

599. INDUSTRIAL PROCESS PROFILES FOR ENVIRONMENTAL USE: CHAPTER 24. THE IRON AND STEEL INDUSTRY

by

Terry Parsons (editor)

The catalog was developed to aid in defining the environmental impacts of U.S. industrial activity. Entries for each industry are in consistent format and form separate chapters of the catalog. The Iron and Steel Industry encompasses a variety of processes for transforming iron ore into fabricated iron and steel products: most large steel mills operate by-product coke plants that produce metallurgical coke and coke by-products. The industry is divided into five segments: ore preparation, coke preparation, coke by-products recovery, pig iron production, and steel manufacturing. Five process flow sheets and 30 process descriptions characterize the industry. For each process description, available data is presented on input materials, operating parameters, utility requirements, and waste streams. Related information presented as appendices include raw materials, company, and product data.

REFERENCE: EPA, 600/2-72-023x, February 1977, pp. 1-209.

600. INDUSTRIAL WASTE SURVEY REPORT - A STUDY OF THE CHARACTERISTICS OF LIQUID WASTES FROM A BY-PRODUCT COKE PLANT

by

Stanley G. Monroe

This study was made in connection with the program of industrial waste studies being conducted by the Public Health Service in cooperation with State Health Departments and other Agencies concerned. The primary purpose is to determine the sources, quantities, and characteristics of wastes produced together with a study of the processes or conditions that materially affect the quantity and characteristics of these wastes. A study was made of the discharges from the principal waste producing operations of the plant. Special studies were made on the dephenolizing unit which employs the benzo extraction process, and also on the gas final cooler recirculating system. This plant operates 385 ovens primarily for the production of metal-lurgical coke. During the period of the study an average of 6,828 tons of coal were carbonized and 5,329 tons of coke produced daily. Gas produced in the coking process is utilized in the plant. During this period, the plant discharged 91/3 lbs. of phenol daily. The ammonia still effluent contained 47.8 lbs., the benzol plant 38.3 lbs. and the coke quench water discharge 5.2 lbs. A total of 31.2 lbs. of cyanides were discharged of which 18.7 lbs. were contained in the ammonia still effluent and 12.5 lbs. in the discharge from the benzol plant. Studies on the dephenolizing plant indicated a 90.9% removal of phenols from the weak ammonia liquor by this unit. A maximum removal of 93.1% was obtained during the period of study. The study on the final cooler recirculation system was made to determine to what extent cyanides may be released to the atmosphere in the exhaust air from the Marley cooling tower. The analyses made indicated that an average of 656 lbs. were discharged daily through the exhaust stacks to the atmosphere as compared to 31.2 lbs. from other plant units discharged in liquid wastes to the sewers. The phenols contained in the Marley exhaust vapors discharged to the atmosphere amounted to 12 lbs. per 24 hours during the period of the study.

REFERENCE: EPA, PB 228 775, May/June 1950.

601. INITIAL REACTIONS IN THE OXIDATION OF NAPHTHALENE BY PSEUDOMONAS PUTIDA

by

A. M. Jeffrey et al.

A strain of an organism capable of utilizing naphthalene was used in determining initial reactions of the total naphthalene oxidation process. The organism was grown on glucose where concentrations of a specific cis dihydrodiol were found to accumulate. This intermediate phase required either NADH or NADPH to occur. The findings were results of both nuclear magnetic resonance spectrometry and radio-chemical trapping procedures.

REFERENCE: Biochemistry, Vol. 14, No. 3, 1975, pp. 575-584.

For articles on related subject see Nos. 324, 325, 327, 328, and 438.

602. INTERPRETATION OF PERSISTENCE AND EFFECTS OF POLYCHLORINATED BIPHENYLS IN BIRDS

by

S. Bailey and P. J. Bunyan

Pigeons and Japanese quail were fed polychlorinated biphenyls (PCBs) with their feed to determine the metabolation of lower chlorinated. Varied concentrations for different periods of time were administered. Analysis of the bird's tissues showed the lower chlorinated PCBs as being more readily metabolized than the higher chlorinated types. In fact, some of the lower chlorinated PCB's were metabolized extremely fast while residues of such highly chlorinated types as 'Aroclor 1254' are commonly found in nature.

REFERENCE: Nature, Vol. 236, March 3, 1972, pp. 34-36.

For articles on related subject see Nos. 333 and 334.

603. AN INVESTIGATION OF FOREIGN BY-PRODUCT COKE PLANT & BLAST FURNACE WASTEWATER CONTROL TECHNOLOGY

by

Harold Hofstein & Harold J. Kohlmann

A study was made to determine if more advanced process for the treatment of by-product coke plant and blast furnace gas cleaning wastewaters were used in foreign plants than in domestic ones. Some unusual techniques for the treatment of blast furnace gas cleaning wastewaters were found. Aerations of gas cleaning wastewater prior to classification improved settling and resulted in a greater rate of recirculation. Filtering the wastewater through slag or flue dust removed cyanide although the removal machanism is not known.

Treatment of by-product coke plant and blast furnace gas cleaning wastewater is generally not more advanced in foreign plants than in the United States. However, blast furnace gas cleaning water in foreign plants is generally recycled to a greater degree.

Discussions were held with plant and corporate personnel at 26 plants in 14 countries and with regulatory agencies in 10 of the 14 countries, to determine the regulations imposed upon the plants, the incentives provided to reduce pollution loads to receiving waters and to investigate treatment technology.

Recommendations for research projects are made, and there appears to be promising areas for improvement of wastewater treatment techniques.

REFERENCE: Proceedings of the Symposium on Iron and Steel Pollution Abatement November 1980, EPA 600/9-81/017, 1981, pp. 479-496.

604. AN INVESTIGATION OF TECHNIQUES FOR REMOVAL OF CHROMIUM FROM ELECTROPLATING WASTES

by

G. R. Smith, Jr.

This report describes work which was conducted on the removal of hexavalent chromium from plating rinse waters employing various treatment processes. The study consisted of an initial phase in which information was sought by questionnaire and by waste water analyses on the type of waste produced by smaller electroplating plants. Laboratory studies were conducted on several nonconventional methods for treatment of these wastewaters including ion flotation, adsorption on activated carbon, and solvent extraction. A demonstration pilot-plant study also was conducted on the activated carbon process employing actual rinse waters from a hard chrome plating operation. The results of the various phases of the study indicated that activated carbon adsorption for chromium removal may have practical application in small plating plants. Further development of the process was recommended in actual plating plant installations.

REFERENCE: EPA, PB 215 694, March 1971, pp. 1-89.

605. ISOLATION OF PCB'S FROM SOIL RECOVERY RATES USING DIFFERENT SOLVENT SYSTEMS

by

G. Seidl, K. Ballschmiter

Soils containing radioactively labelled clophen A-30 (A PCB) were treated with different solvents to determine recovery rates. Soxhlet-extraction with acetone of acetonitrile showed the best recovery at above 95%. Soxhlet-extraction with hexane or homologies or cold extraction with acetone using ultrasonic bath did not show good PCB recovery from soil.

REFERENCE: Chemosphere, No. 5, 1976, pp. 373-376.

606. LAGOONING AND SPRAY DISPOSAL OF NEUTRAL SULPHIET SEMI-CHEMICAL PULP MILL LIQUORS

by

Don Voights

This report discussed the change of a pulp mill's sulphite liquor disposal system to one utilizing lagoons and spray disposal. The change became necessary because of increased production of effluent which began to contaminate the nearby water supplies. Spraying of the liquor resulted in complete killing of all growth present. After a period of time, the inorganic salts present were washed from the soil by rainfall leaving the organic sludge to act as a fertilizer. The pollution of the local lake and stream was eliminated by this process. The life expectancy of the disposal site appears to be indefinite assuming present production.

REFERENCE: Proceedings of the 10th Industrial Waste Conference, Purdue University, Vol. 89, 1955, pp. 497-507.

607. LAND DISPOSAL OF PHARMACEUTICAL MANUFACTURING WASTES

by

George C. Colovos and Nelson Tinklenberg

Spray irrigation has been used as a method for disposal of fermentation spent beers. The beers disposed of by spraying, in this article, contained 1-5% total solids content and were highly colored, malodorous, Chlorine pretreatment deodorized the liquid. Then the liquid was sprayed to the equivalent of 1½ inches of rainfall over the test area. The disposal method worked satisfactory, and no anaerobic conditions were present or developed.

REFERENCE: Biotechnology and Bioengineering, Vol. 4, Issue 2, 1962, pp. 153-160.

608. LONG-TERM FIELD EXPERIMENTS WITH SMALL APPLICATIONS OF BORON

by

M. Ødelien

This experiment studied the long-term effects of boron deficiency on swedes, a plant strongly affected by low boron concentrations. High concentrations applied over an extended period of time resulted in a slight decrease in crop production. Smaller concentrations on an annual basis essentially eliminated deficiency symptoms, such as root discoloration. Increased symptoms were seen on untreated plots of land. This is a result of low initial soil concentrations as well as boron loss due to leaching and crop uptake.

REFERENCE: Soil Science, Vol. 95, 1963, pp. 60-62.

For articles on related subject see Nos. 89, 90. 339, and 340.

609. MEASUREMENT OF PERCHLOROETHYLENE IN AMBIENT AIR

by

G. F. Evans et al.

A series of field studies was conducted of various urban sites to determine the perchloroethylene concentrations of the surrounding air. A slight variation between the three cities studied was found with the highest amounts located in areas producing the greatest amount of pollutant. A noticeable variation also existed on different days of the week.

REFERENCE: EPA, 600/4-79-047, August 1979, p. iv.

For articles on related subject see Nos. 341, 342, and 343.

610. A MECHANISTIC MODEL OF A PACKED-BED ELECTRODE CELL TO REMOVE METAL IONS FROM DILUTE EFFLUENT SOLUTIONS

by

Anthony W. Bryson and Kevin A. Dardis

A porous cathode cell derived as a methematical model was acquired in a basic kinetic parameter for the sediment of metals from dilute solutions. In order to treat electroplating waste effluents, the model pilot plant was designed. Data shows through experiments that copper, nickel, chromium and zinc concentrations were lowered by at least 90% allowing an efficient current to continue. The pilot plant was made to efficiently reduce nickel from 20 mg dm^{-3} to 2 mg dm^{-3}. This was to allow a flow rate of 180 dm^3h^{-1} and a current of 30 A. The procedure was successful, but chromium was sited in the effluent. Through the data gathered, it has been decided that the modeling and design procedure can be applied to a certain size and operating conditions of reasonable large-scale cells.

REFERENCE: Journal of Chem. Tech. Biotechnol., Vol. 30, 1980, pp. 14-19.

611. MEETING BPT STANDARDS FOR INTERMEDIATE AND SECONDARY REFINERY WASTEWATER TREATMENT

by

D. L. Ford and L. F. Tischler

Methods of treating refinery wastewater in the intermediate and secondary stages are assessed as to their compliance with a section of the Federal Water Pollution Control Act. The primary concern is meeting best practicable technology (BPT) as outlined by the EPA. Intermediate treatment consisted of dissolved air floatation (DAF), coagulation-precipitation and equilization procedures. The secondary procedures discussed were the use of high-rate activated sludge and, in most cases, filtration. Other secondary treatment methods are also available, such as aerated lagoons and trickling filters. These techniques can often be used as a polishing step in the treatment facility. Their use as the sole means of secondary treatment, however, is limited to special circumstances.

REFERENCE: Industrial Wastes, Vol. 23, No. 5, September/October 1977, pp. 41-45.

612. METHOD AND COMPOSITION FOR TREATING WOOD WITH PENTACHLOROPHENOL

by

Roy P. Kirchner

A composition for impregnating wood with pentachlorophenol is prepared by dissolving pentachlorophenol in a petroleum fraction, at least 50% of which will distill above 485°F, and mixing the resulting solution with water to produce a finely divided dispersion of the solution in water.

REFERENCE: United States Patent, No. 4,296,152, October 20, 1981.

For article on related subject see No. 344.

613. MICROBIAL DEGRADATION OF EKOFISK OIL IN SEAWATER BY SACCHAROMYCOPSIS LIPOLYTICA

by

F. C. Størmer and A. Vinsjansen

This report is a detail of experiments evaluating the effect of pH and temperature on the production of acid from the degradation of Ekofisk oil by the yeast Saccharomycopsis Lipolytica. During the experiments, the pH dropped to various levels, depending on the conditions used. The experiments were performed at 8°C and 20°C. These temperatures were used because of the temperature in the North Sea basin.

REFERENCE: AMBIO, Vol. 5, No. 3, 1976, pp. 141-142.

For articles on related subject see Nos. 300 and 488.

614. MICROBIAL TRANSFORMATIONS OF ANTIBIOTICS

by

Oldrick K. Sebek and D. Perlman

Although microorganisms have been used to generate intermediates for synthesis into steroids, and some antibiotics have been modified by microbial degradation, such as the hydrolysis of benzlpenicillin to 6-aminopenicillanic acid and of mannosidostreptomycin to streptomycin, there is still a lacking in the extended use of microbial antibiotic modification. This article is a call for greater research emphasis in this direction.

REFERENCE: Advances in Applied Microbiology, Vol. 14, 1971, pp. 123-149.

For articles on related subject see Nos. 354 and 358.

615. MINIMIZING GOLD WASTE AND REDUCING GOLD THICKNESS ON PCBs

by

J. S. Stevenson

This article deals with gold waste and thickness reduction. A comprehensive study on all cost savings has not been made. However, some costs in which the operator can contribute have been reduced. The transition metal hardened acid gold processes are referred to in this article. This information may be applied to eletroplating processes used in various industries.

REFERENCE: Finishing Industries, August 1979, pp. 16-21.

For articles on related subject see Nos. 180 and 361.

616. MUTAGENIC AND TOXIC ACTIVITY OF ENVIRONMENTAL EFFLUENTS FROM UNDERGROUND COAL GASIFICATION EXPERIMENTS

by

H. Timourian et al.

Screening for mutagens and toxics present in extracts from goundwater was done by using bacterial bioassays. It was also done for tar from product gas at two sites located at Lawrence Livermore National Laboratory. Gasification processes might be considered biologically hazardous, implying human health concerns. Mutagens were present following 2 years of terminated gasification. The activity and chemical composition changed with time. The mutagens suggested amounts of quinoline and aniline derivatives in the groundwater. Toxins showed groundwater to have parts of phenolic compounds. Organic bases and neutrals were found to be genotoxic from the bacterial and mammalina cells found in tar of product gas. The tar being bacterial and mammalian along with mutagenic represents a disposal problem. In conclusion, the tar is difficult to assess for a health hazard to low mutagenic activity. This is perhaps because of contaminants in the neutral fraction that suppress mutagenicity.

REFERENCE: Journal of Toxicology and Environmental Health, Vol. 9, 1982, pp. 975-994.

For articles on related subject see Nos. 93, 94, 95, 366, 367, and 368.

617. NATIONAL INVENTORY OF SOURCES AND EMISSIONS: ARSENIC

by

W. E. Davis and Associates

Data assembled is that of the nature, degree, and extent of atmospheric arsenic emissions in the United States for 1968. Overall factors reported on are from a single arenic producing plant; copper, zinc, and lead smelters; and reprocessing companies used 50% of all arsenic consumed in the United States in 1968.

REFERENCE: APTD-1507, PB 720-619, 1971, pp. 1-60.

618. NICKEL RECOVERY FROM ELECTROPLATING RINSEWATERS BY ELECTRODIALYSIS

by

John L. Eisenmann

A program to demonstrate the feasibility of metal salt recovery and pollution control on a Watts-type nickel plating line by electrodialysis was conducted at Risdon Manufacturing Co., Waterbury, CT. Each of two reclaim rinse tanks, arranged in series following plate tanks, was treated by recirculating the rinse solutions through separate electrodialysis stacks. The first rinse solution was maintained at 2-5 g/l nickel, and the second rinse held at 0.3-0.4 g/l nickel over several months of plating operations. The nickel salts recovered from the rinse solutions were concentrated 20-fold by the electrodialysis treatment and could be returned directly to the plate tanks for reuse. Several operational problems are discussed and recommendations made. It is concluded that electrodialysis can be useful and economically viable process for the treatment of at least some types of electroplating rinses. Both plating-metal recovery and pollution control are accomplished. A cost estimate based on the data obtained during the demonstration indicates that 95% of the nickel lost from untreated rinses could be recovered and that ancillary benefits in sludge disposal, use of treatment chemicals, etc. could be realized. Payback periods of less than 18 months are anticipated for commerical units.

REFERENCE: EPA, 600/2-81-130, July 1981, pp. 1-54.

For articles on related subject see No. 183.

619. NITRIFICATION OF COKE OVEN WASTEWATER WITH HIGH AMMONIA CONCENTRATION

by

Meint Olthof

Coke oven wastewater containing high concentrations of ammonia must undergo nitrification by one of several different treatment methods. This study briefly discussed each, but since the waste under concern contains high ammonia amounts, only one technique was studied in detail in light of its advantages over the other methods. Biological nitrification was found to exhibit good COD removal which agreed with past studies. Lower yield coefficients produced higher nitrifer percentage in sludge and vice-versa. Most data gathered coincided well with that from previous experiments. The major disadvantage to this method is the production of nitrates which in some instances may be to be treated separately.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 22-25.

For article on related subject see No. 369.

620. NPRA'S '72 PANEL VIEWS PROCESSES

A selection of answers from the National Petroleum Refiners Association 1972 Question and Answer Session are concerned with hydrogen fluorine alkylation, sulfuric and alkylation, reforming, hydrotreating, catalytic cracking, environmental control, and delayed coking. Hints of processing and operating guidelines are given.

REFERENCE: Hydrocarbon Processing, Vol. 52, No. 4, April 1973, pp. 143-154.

For articles on related subject see Nos. 184 and 371.

621. ODOR CONTROL IN WOOD PRESERVING PLANTS

by

C. W. Best and P. C. Gaskin

A certain process had been established in order to take care of preserving wood. A schedule was set up in which the wood was transferred from a cylinder to the end process. Moving the wood then to a yard, either located at the plant or made ready for shipment, takes place. The process of caring for and making the wood ready can cause odors unpleasant to residents. Therefore, improvements in the process involved a vacuum of the excess preservatives into the atmosphere. Also, the time in which the wood products were taken from the cylinder was changed so as not to disturb the neighboring community between 7:00 pm and 6:00 am. A general upgrade in the processing equipment went from steam ejector to electrical power.

REFERENCE: American Wood-Preservers' Association, 1979, pp. 105-108.

622. OXIDATION OF POLYCHLORINATED BIPHENYLS BY ACHROMOBACTER pCB

by

M. Ahmed and D. D. Facht

Various chemicals were purchased from North Haven, Connecticut. Dichlorobiphenyl, trichlorobiphenyl, tetrachlorobiphenyl, and pentachlorobiphenyl were the four elements selected although there is quite a selection among the four chemicals. All of these polychlorobiphenyls were oxidized by bacteria with the exception of 2,5,3',4'-tetrachlorobiphenyl. Every polychlorobiphenyl was oxidized without lag except 3,3'-dichlorobiphenyl. When tested on pure cultures of Achrombacter polychlorobiphenyl, 2,3-DCB, 2,4-DCB, 3,4-DCB, and 3,5-DCB were oxidized. Those chemicals slightly oxidized were 3,4,2'-TCB, 2,3,2',3'-TCB and 2,3,4,5,6-PCB. The rate of oxidation is thought to be the result of degradation of an unsubstituted ring. All the dichlorobiphenyls had one unsubstituted ring except 3,3'-DCB.

REFERENCE: Bulletin of Environmental Contamination/Toxicology, Vol. 10, No. 2, 1973, pp. 70-72.

For articles on related subject see Nos. 374 and 375.

623. OXIDATIVE METABOLISM OF PHENANTHRENE AND ANTHRACENE BY SOIL PSEUDOMONADS

by

W. C. Evans et al.

Phenanthrene and anthracene were studied as to their metabolism in the soil. The study emphasized the ring-fission process which occurred in the metabolism of both substances. The metabolism was accurately traced for both chemicals. Phenanthrene resulted as naphthalene, of which the metabolism is known. Anthracene metabolized in much the same manner, but resulting as 2-hydroxy-3-naphthoic acid of which the metabolism was mentioned. An enzyme in the soil organism used is responsible for portions of the metabolic processes involved.

REFERENCE: Biochem. Journal, Vol. 95, 1965, pp. 819-831.

For article on related subject see No. 377.

624. PENTACHLOROPHENOL AND NAPHTHALENE EMISSIONS TO AIR DURING THERMAL EVAPORATION OF WASTEWATER

by

L. J. Thibodeaux et al.

This paper presents a model which attempts to predict the loss of pentachlorophenol and naphthlene into the air during certain wood treatment processes. Utilizing previously proved models along with a number of modifications resulted in the final values in this equation. Calculations from this model were then compared with experimental emission rates. A reasonable correlation between the predicted air emissions and the measured experimental one was found to indicate this model as being an adequate predictor.

REFERENCE: 1981 Meeting of the American Institute of Chemical Engineers, New Orleans, LA, November 8-12, 1981, pp. 1-13.

For article on related subject see Nos. 380.

625. THE PERMANENCE OF PENTACHLOROPHENOL IN PRESERVED JOINERY TIMBERS

by

R. J. Orsler and M. W. S. Stone

The effectiveness of dipping timber in pentachlorophenol as a preservative was studied. Bioassay experiments were conducted to assess the resistance after treatment to various fungi. A similarity was found between PCP loss and formally tested y-HCH loss, although PCP loss was significantly slower. Results of analyzed lumber showed a possible deficiency in the preservatives effectiveness. Precise data was also gathered on movement of the PCP within the wood. However, the results gathered still do not provide a precise answer to the problem.

REFERENCE: International Journal of Wood Preservative, Vol. 1, No. 4, 1981, pp. 177-183.

626. PHYSICAL/CHEMICAL TREATMENT OF COKE PLANT WASTE WATER

by

Richard Osantowski et al.

The report documents a pilot-plant study of the use of advanced waste treatment methods in upgrading metallurgical coke making waste waters to Best Available Technology (BAT) levels. Mobile treatment units, operable at a flow rate of 19 l/min, were used. Two physical/chemical treatment trains were studied: a. alkaline-chlorination/filtration/activated-carbon. and b. alkaline-chlorination/sodium-bisulfite-dechlorination/filtration. For each treatment studied, samples (including toxic pollutants) and operational data were obtained for later use in assessing and comparing treatment adequacy. Chlorination was effective in consistently reducing pollutant concentrations to below BAT levels, except for total cyanide. Filtration was essential as an adjunct to alkaline chlorination for post-treatment suspended solids removal. Activated carbon and sodium bisulfite were efficient in removing excess chlorine resulting from treatment by alkaline chlorination, although carbon was more effective in removing organic priority pollutants.

REFERENCE: EPA, 600/2-81-053, April 1981, pp. 1-207

For article on related subject see No. 185.

627. PLATING POLLUTION: THE LATEST FROM EPA

This report on the proposed EPA guidelines for effluent originating in plating plants. The regulations, before ratification, were brought before a convention of metal plating company representatives who strongly opposed the new standards. These standards were to include a maximum liters/square meter of pollutant/surface area for discharge amounts and limitation of rinse water to be used. Portions of the discussion period of the meeting are recorded in this report. Because of the controversy of this proposed legislation, the new guidelines were under "intense review" in the hope of getting them changed.

REFERENCE: Products Finishing, Vol. 36, No. 7, April 1974, pp. 141-145.

For articles on related subject see Nos. 385 and 386.

628. POLLUTION FROM US EXPLOSIVES AND PROPELLANTS PRODUCTION

by

L. K. Wang et al.

This paper presents a perspective of selected munitions manufacturing wastewaters generated at Government owned-contractor operated (GOCO) plants. Since nitrocellulose wastewater occurs as a colloid and is not open to biodegradation, physiochemical pretreatment is necessary prior to any biological treatment system. Nitroglycerin wastewater, as a dissolved pollutant, is considered to be carried by streams without settling in reservoirs or lakes. The production of 2,4,4-trinitrotoluene (TNT) from toluene by the nitration procedure also brings about significant wastes. Dry-fill operations are an improved processing technique which eliminates amounts of phossy water and would create the pollutant only at transfer and cleaning operations. The dry-fill method will minimize waste pollution and eliminate air pollution due to phosphorus oxides.

REFERENCE: Effluent and Water Treatment Journal, June 1982, pp. 222-225.

629. POTENTIAL TOXICANTS FOR CONTROLLING SOFT ROT IN PRESERVATIVE-TREATED HARDWOODS

PART V.

by

Laurie J. Cookson et al.

Laboratory testing of various groundline maintenance treatments for remedial control of soft rot showed that Busan 72, and 30; TCMTB; Stannicide AQ; BLLIE 7 Paste; Basilit BFB Paste; PATOX Bandage 1; and Wolmanol Bandages BF and CBF could be used for remedial soft rot treatment.

REFERENCE: Material UND Organismen; Beiheft, Vol. 16, No. 1, 1981, pp. 1-13.

630. POTENTIALLY BENEFICIAL USES OF SULFURIC ACID IN SOUTHWESTERN AGRICULTURE

by

S. Miyamoto et al.

Air pollution control regulations implemented by means of acid plants projected to exceed market demand in Southwestern U.S.A. Surplus acid used in considerable quantities can be beneficial for several things. For example, reclaiming sodium-affected calcareous soils, increasing the phosphorous availability, and treating alkaline and ammoniated irrigation water. This improves range grass, controls various weeds, and can be used for various other purposes. These principles involved are fairly well-established, but further studies are required to determine special effects in field application areas.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 4, 1975, pp. 431-437.

631. PRACTICAL GUIDE TO TREATMENT OF CHROMIUM WASTE LIQUORS

by

John Kraljik

This paper gives a general discussion of treating chromium containing wastes. Given is a table containing EPA limitations of chromium content in effluent and maximum quantities, which can be produced per day or month. The paper then presents a brief discussion of such methods as chemical precipitation, electrolyte reduction, activated carbon, ion-exchange, evaporation and electrodialysis. Finally, the report gives factors to be considered in selecting the appropriate treatment process for a given situation including theoretical results.

REFERENCE: Metal Finishing, Vol. 73, October 1975, pp. 49-55.

632. PROCEEDINGS OF THE SECOND OPEN FORUM ON MANAGEMENT OF PETROLEUM REFINERY WASTEWATER (ENVIRONMENTAL PROTECTION TECHNOLOGY SERIES)

by

Edited by: Francis S. Mannig

Data from the second open forum on management of petroleum refinery wastewater, held in Tulsa, OK, June 6-9, 1977 is compiled in this report. Papers, questions, answers, present and future research and regulation directions, problems in wastewater management, biotreatment, and various other related information is included. Speakers represented all agencies, committees, and interest groups.

REFERENCE: EPA-600/2-78-055, PB 284-247, 1978, pp. 1-564.

For articles on related subject see Nos. 389 and 390.

633. PROCESS CONTROL FOR ACTIVATED SLUDGE TREATMENT OF COKE PLANT WASTEWATERS

by

Andrew C. Middleton

Once an activated sludge system has been started up and brought to steady operation, control methodology must be applied to it to maintain it in such a state. Additionally, during the life of the system, the situation may change from that of the original design, and the control methodology must be capable of maintaining control in such situations. This paper presents a straight forward, rapidly interpretable control methodology based on solids retention time (SRT), a methodology for determining capacities of an existing system, and an illustration of these for a coke plant activated sludge system.

REFERENCE: Proceedings of the Symposium on Iron and Steel Pollution Abatement, November 1980, EPA 600/9-81-017, November 1981, pp. 321-342.

634. PROCESS FOR TREATING AQUEOUS LATEX PAINT WASTES

by

Joseph C. Sherwood and Richard T. Brunbeck

A process for producing leach-resistant consolidate from the slack sludge precipitated from the flocculating of dilute aqueous latex paint waste is shown. It comprises: rapidly heating said slack sludge with agitation to a temperature which at least approaches the boiling point of the water present in said sludge; settling the resulting heated mixture into a consolidate fraction and a serum fraction; and separating said fractions. Such consolidate can be used for landfill, structural units, or dispersed as a component of a paint.

REFERENCE: United States Patent, No. 4,312,759, January 26, 1982.

635. PROCESSING REFINERY WASTEWATER BY COAGULATION AND FLOTATION FOLLOWING BIOLOGICAL OXIDATION

by

Arthur E. Franzen

The refinery effluent treatment sequence consisting of API separators, aerated lagoon, chemical destabilization, and dissolved air flotation provides generally good effluent quality. Quality variability due to seasonal aerated lagoon performance, phenolics residuals above-pending goals and minimal nitrification capacity, however, severely limits the applicability of this sequence to meet increasingly stringent quality goals. Dissolved air flotation is a useful unit operation in any refinery end-of-pipe effluent treatment sequence. Extensive work on a here to fore ignored approach to optimization of this unit operation involving negating the mutual repulsion of negatively charged flotation bubbles and negatively charged suspended solids is reported. Extensive background on appropriate water chemistry, properties, and characteristics of chemicals used in destabilization of colloid systems, chemical antagonists in waste waters, principles involved in colloid destabilization, and chemical models proposing a mechanism for destabilizing negatively charged solids with negatively charged polyelectrolytes is presented. Important design considerations for air flotation units are discussed, and guidelines for optimization of performance by proper chemical destabilization are presented.

REFERENCE: EPA, 600/2-89-047, February 1980, pp. 1-315.

636. A RAPID SCREENING METHOD FOR ENVIRONMENTAL ASSESSMENT OF FOSSIL ENERGY PROCESS EFFLUENTS

by

L. M. Schalit and K. J. Wolfe

The report describes the simplest member of a sequence of Source Analysis Models (SAMs) of increasing complexity and thoroughness which can be used as tools to help with one or more of five tasks involved in the environmental assessment of energy and industrial processes. The tasks are: 1. ranking individual effluent streams by the expected toxicity of their discharges, 2. establishing sampling priorities, 3. determining problem pollutants, 4. recommending best multimedia control technology alternatives, and

5. recommending control/disposal technology development programs. This model, SAM/IA, is useful for rapidly screening each effluent stream from a specific source: it is based on comparing effluent concentrations with the set of Minimum Acute Toxicity Effluent (MATE) criteria established by the EPA. The report explains the purposes of SAM/IA, the format used, and the MATE criteria against which pollutants are gauged. Several examples are included to illustrate specific facets of the model and of the formate.

REFERENCE: EPA, 600/7-78-015, February 1978, pp. 1-168.

For article on related subject see No. 188.

637. RECLAMATION OF METAL VALUES FROM METAL-FINISHING WASTE TREATMENT STUDIES

by

Arch B. Tripler, Jr. et al.

The effects of this program have included the determination of the worth of recovery metal values from metal-finishers' wastewater treatment sludges, the definition and research of processes for such recovery, and the selection, design, and costing of a recommended process. The study included a survey of the literature to determine the state-of-the-art regarding the generation, disposal, and recovery processes possibly applicable to those sludges. This information was supplemented with a survey by questionnaire to determine the current status of relevant practices and conditions. Field investigations provided detailed examples of plant practices, sludge storage conditions, and sludge characteristics. The extraction of metal values from waste sludge by various leaching agents, and the recovery of metal values by techniques including electrowinning, cementation, and liquid-liquid ion exchange were studied. A portable pilot process for the treatment of waste sludges and recovery of metal values was selected and equipment and operating costs developed.

REFERENCE: EPA, 670/2-75-018, April 1975, pp. 1-97.

638. RECOVERY AND UTILIZATION OF CHEMICALS FROM BY-PRODUCT WASTES OF THE COKING INDUSTRY

by

D. K. Sen et al.

This is a discussion of the production of useful materials from coking by-product wastes, and also presents information on processing coalter fractions into a greater variety of useful chemicals.

REFERENCE: Chemical Age of India, Vol. 28, No. 1, January 1977, pp. 55-65.

639. RECOVERY OF ZINC FROM WASTEWATER TREATMENT SLUDGE

by

J. B. Stephenson et al.

A procedure is described pertaining to the removal of zinc from wastewater treatment sludge. The procedure used included roasting, leaching-purification and electrowinning. One modification of this system over previously accepted ones is a more complex purification process arising from large amounts of impurities being extracted with the zinc. More data is needed to determine impurity accumulation from electrolyte recycling and adequate disposal of leach residues.

REFERENCE: Resource and Conservation, Vol. 6, 1981, pp. 203-210.

640. RECYCLE OF SYNTHETIC WARP SIZES FROM TEXTILE DESIZING WASTEWATER

by

Carl E. Bryan

A process has been developed for recovering and reusing the warp sizing material, carboxymethyl cellulose, from textile plant desizing wastewater. The carboxymethyl cellulose was precipitated with aluminum sulphate and dewatered to a solid level of 10-15% using a centrifuge of Dual Cell Gravity unit and a Multi Roll Press. Use of the recovered carboxymethyl cellulose in sizing fabrics of polyester and cotton (65:35) and polyester and rayon (65:35) proved to be satisfactory.

REFERENCE: Environmental Protection Technology Series, EPA-600/2-75-014, June 1975, pp. 1-51.

641. REDUCED TOXICITY OF AN AQUEOUS COAL-CONVERSION EFFLUENT FOLLOWING WASTE DISPOSAL TREATMENT

by

T. Wayne Schultz

The effectiveness of two coal refinery waste treatment processes was studied. One process was the sand-filter stream (SFS), and the second was the carbon-filter stream. The ciliate Tetrahymena was used to assess the toxicity of waste constituents. Harmful effects of the effluent at concentrations under 20% were essentially none. Problems arising at higher concentrations were probably caused by aromatic amines, analine, quinoline and possibly unaccounted for trace elements. The treatment process does prove useful, however, in controlling toxicity of essentially all compounds in lower effluent concentrations.

REFERENCE: Bull. Environ. Contam. Toxicology, Vol. 20, 1978, pp. 633-639.

642. REDUCTION OF ENERGY & RESOURCE USE IN COKE WASTEWATER TREATMENT

by

John P. Garvin

This paper presents a method by which the bio-oxidation step of coke plant wastewater treatment may be conducted in a manner that would reduce the amount of energy and resources needed. Electrical energy, land space, and concrete were the main resources under concern. Modifications mentioned were: 1. an alternate physical design of the basin; 2. a system to cool the waste for bio-oxidation, 3. the potential use of commerical coagulants and growth factors such as glucose during the clarification stages of treatment.

REFERENCE: Energy and the Environment: Proceedings of the National Conference, Vol. 6, 1979, pp. 307-312.

643. REFINERY WASTE DISPOSAL SCREENING STUDY

by

Juanita Galloway

Estimations of the quality and phase characteristics for major refinery solid waste streams were taken from information compiled for the OAQPS which requested this same data in 1978. Also a supplementary report was given as a base to develop a AP-42 factor for VOC emissions for refinery solid wastes. Solid waste control technologies are described and analyzed. A listing for operators in the organic waste industry is provided.

REFERENCE: EPA-450/3-79-019, PB 299-351, 1979, pp. 1-188.

644. REFINERY WASTEWATER TREATMENT AND REUSE

by

Kenneth E. Bush

This report gives a general discussion of refinery wastewater treatment. A brief background of rules and regulations is followed by a list of a number of treatment processes and their categorization into primary, intermediate and secondary/tertiary classes. Because of an abundance of hydrogen sulfide and ammonia in refinery wastewaters, their removal by air or steam stripping was discussed as was dissolved-air floatation of pH control. Several of the secondary and tertiary methods were described according to their design, use, and efficiency. Finally, the paper discussed the complexity of various treatment systems, which depends upon the amounts and types of waste being produced.

REFERENCE: Chemical Engineering, Vol. 83, No. 3, April 12, 1976, pp. 113-116.

645. REMOVAL OF CYANIDES FROM COKE PLANT WASTEWATERS BY SELECTIVE ION EXCHANGE--RESULTS OF PILOT TESTING PROGRAM

by

Robert A. Bessent et al.

Selective ion exchange was analyzed as to its effectiveness in removing free and complex cyanides from coke plant wastewaters. This pilot program showed selective ion exchange technology as being effective in reducing complex cyanide concentrations in effluent. A preliminary step in this process adequately reduced free cyanide to levels below metropolitan sewage limitations. Work is now being done on specific design of the project for industrial use. The only significant problem found with this process is the disposal of the sludge produced by iron sulfate addition, which is thought to contain potentially hazardous materials.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 47-62.

For article on related see No. 7.

646. REMOVAL OF EMULSIFIED OIL WITH ORGANIC COAGULANTS AND DISSOLVED AIR FLOTATION

by

Richard G. Luthy et al.

This study investigated the use of organic coagulants along with dissolved air flotation (DAF) for emulsified oil removal from wastewater. Using the proper coagulant and controlling pH were the most important factors for oil removal. Chemical additives had little effect on efficiency when these two factors were controlled. Oil removal was decreased when high levels of surfactants were present showing the need for their control. High concentrations of coarse oil suspensions were not found to either be harmful to the (DAF) process or to the initial oil droplet coagulation.

REFERENCE: Journal WPCF, February 1978, pp. 331-346.

647. REMOVAL OF EXPLOSIVES FROM LOAD-ASSEMBLE-PACK WASTEWATER (PINK WATER) USING SURFACTANT TECHNOLOGY

by

Donald J. Freeman and Olin A. Colitti

Composition B wastewater (pink water) that contains dissolved toxic explosives, namely TNT or RDX, which cannot be treated by usual methods, can be treated by surfactant removal. The surfactants tested were Amine N-Tallow Diaminopropane; Quaternary Amines Trinethyl Tallow Ammonium Chloride; and N, N, N', N', N'-Pentamethyl-N-Tallow-1,3-Propane Diammonium Dichloride. All of the surfactants were effective in removing TNT and RDX from the effluent. But N, N, N', N', N'-Pentamethyl-N-Tallow-1,3-Propane Diammonium Dichloride proved to be the most promising of the surfactants tested because of its low cost and chemical features more desirable than the other surfactants.

REFERENCE: 36th Proceedings of the Industrial Waste Conference, 1982, pp. 383-394.

648. REMOVAL OF HEAVY METALS FROM ELECTROPLATING RINSEWATERS BY PRECIPITATION, FLOCCULATION AND UNTRAFILTRATION

by

Erik R. Christensen and John T. Delwiche

Chromium, nickel, copper, and zinc can be effectively removed from electroplating rinsewaters by applying hydroxide precipitation. Each element was reduced by a form of precipitation. The way water recovered depended a lot on the type of metal removed. During the ultrafiltration run, mass balance assumed the concentration function.

REFERENCE: Water Resources, Vol. 16, No. 5, May 1982, pp. 729-737.

649. REMOVAL OF PHENOLIC COMPOUNDS FROM WOOD PRESERVING WASTEWATERS

by

Bruce K. Wallin et al.

Laboratory and pilot-scale studies were undertaken to develop economically feasible technologies for the treatment of wastewaters from wood preserving operations. Of prime concern was the removal of phenol and its chlorinated derivatives, in particular, pentachlorophenol. Screening analysis of the wastewater indicated that pentachlorophenol was the only chlorinated derivative consistently present in concentrations of approximately 100 mg/l.

Treatment technologies investigated for the treatment of these wastewaters included:

1. adsorption,
2. biological oxidation,
3. chemical oxidation,
4. coagulation,
5. extraction, and
6. pH adjustment.

Each of the above, alone or in combination, was capable of yielding a measurable reduction in the concentration of total phenols and pentachlorophenol in the untreated wastewater.

Two technologies yielded consistently high levels of treatment:

1. pH adjustment of the wastewater, followed by adsorption with bentonite clay and final polishing by the polymeric adsorbant, XAD-4, and
2. pH adjustment of the wastewater, followed by extraction with a mixture of #2 fuel oil and a co-solvent such as still bottoms from amyl alcohol production.

REFERENCE: EPA, 600/S2-81-043, April 1981, pp. 1-3.

650. REMOVAL OF 2,4,6-TRINITROTOLUENE (TNT) AND 1,3,5-TRINITRO-1,3,5-TRIAZACYCLOHEXANE (RDX) FROM AQUEOUS SOLUTIONS WITH SURFACTANTS

by

Y. Okamoto et al.

2,4,6-trinitrotoluene and 1,3,5-trinitro-1,3,5-triazacyclohexane can be removed by surfactants that contain amino and quaternary ammonium groups. The explosives TNT and RDX are found in composition B (pink) waste water, and treatment of this waste water with ammonium cationic surfactants removes (TNT) by forming an insoluble and non-explosive solid, while simultaneously (RDX) is hydrolyzed.

REFERENCE: Propellants, Explosives, Pyrotechnics, Vol. 7, 1982, pp. 18-21.

For article on related subject see No. 506.

651. RENOVATION OF A WOOD TREATING FACILITY

by

W. Lawrence Ramsey et al.

This paper looks at the renovation of an out-of-service wood processing facility in St. Mary's County, Maryland. The plan is a joint effort between regulatory and service agencies and the private sector to clean up a striking hazardous waste problem in a fairly commonplace industrial operation. In doing this project, the state had several objectives in mind. One was to demonstrate the feasibility of reclaiming a hazardous waste site. Another was the development of low cost, unsophisticated solutions to waste problems to encourage cooperation and participation by industry in cleaning up their own problems. The final objective was to treat or destroy hazardous wastes at, or as close to, the point of generation as possible.

REFERENCE: National Management of Uncontrolled Hazardous Waste Sites Conference, 1981, pp. 212-214.

652. A REPORT ON THE CONTROL OF CHROMIUM IN PLATING SHOP EFFLUENTS

by

American Electroplaters' Society Environmental
Pollution Control Subcommittee

Presented is a general report on the production and treatment of chromium produced from plating shops. Chromium discovered in drinking water has been shown to cause severe problems at high enough concentrations. The toxicity of chromium to animals or humans is related to its valency, quantity, oxygen present and the type of organism it acts upon. Hexavalent chromium is treated by its conversion to trivalent chromium, which is then neutralized and precipitated. Several systems are available for its treatment, some are still in the developmental state and connot be evaluated yet. However, methods are available to provide an acceptable technique of its treatment.

REFERENCE: September 1970, pp. 889-892.

653. RESEARCH STUDY OF COAL PREPARATION PLANT AND BY-PRODUCT COKE PLANT EFFLUENT

by

Edward F. Pearson

Source stream characterizations and bench/pilot treatability studies were performed on waste water from an integrated coal washery/by-product coking operation at an iron and steel plant. Major parameters of interest were phenolics, cyanide, ammonia, and suspended solids. The feasible treatment schemes identified among nine procedures tested were: biological activated sludge and carbon adsorption (for phenolics and cyanide); steam stripping/acid adsorption (for ammonia); and neutralization/polyelectrolyte addition/centrifugation (for coal suspensions). In addition, a new full-scale design for the coal preparation plant was produced.

REFERENCE: EPA, 660/2-74-050, April 1974, pp. 1-312.

654. RESIDUES OF QUINTOZENE, HEXACHLOROBENZENE, DICHLORAN AND PENTACHLOROANILINE IN SOIL AND LETTUCE

by

W. Dejonckheere et al.

This experiment studied the uptake of quintozene (PCNB), hexachlorobenzene (HCB), and dichloran from treated soils by lettuce plants. All three substances were readily absorbed by the lettuce plants. PCNB was metabolized into both pentachloroaniline (PCA) and pentachlorothioanisole (PCTA). PCA was also absorbed by the plants through the root system. The PCNB/HBC ratio in plant tissue was essentially the same as the same ratio in the soil.

REFERENCE: Bull. Environ. Contam. Toxicology, Vol. 13, 1975, pp. 720-729.

For article on related subject see Nos. 396.

655. SAND FILTRATION OF WASTEWATER FROM MILITARY VEHICLE WASHING FACILITIES

by

E. Lubieniecki, Jr. et al.

This report discussed the use of sand filtration as a method of treating military vehicle washing wastewater. The sand filtration system is used in conjunction with sedimentation procedures. Measurements were made for removal of both total suspended solids (TSS) and biological oxygen demand (BOD_5). Although effluent from the sand columns varied considerably in quality, all samples tested satisfied EPA regulations. Studies done so far have also shown this method of treatment to be not only effective, but one requiring little operational cost and time.

REFERENCE: Proceedings of the 34th Industrial Waste Conference, Purdue University, May 8-10, 1979, pp. 655-663.

For articles on related subject see Nos. 116, 397, 398, 399, 408, 508, and 509.

656. SCREENING STUDY TO DEVELOP BACKGROUND INFORMATION AND DETERMINE THE SIGNIFICANCE OF AIR CONTAMINANT EMISSIONS FOR PESTICIDE PLANTS

by

C. N. Ifeadi

In this study, available background information is developed and the significance of air contaminant emissions from the manufacture of six pesticides determined. Pesticide studies are 1. insecticides: methyl parathion and toxaphene, 2. herbicides: MSMA and trifluralin, 3. fungicides and wood preservatives: pentachlorophenol, and 4. fumigant: paradichlorobenzene. Background information is gathered from published data and responses to the questionnaires sent to the pesticide manufacturing firms. Based on the available data, production projections are made up to the year 1980. A list of manufacturers of each pesticide is presented. Manufacturing processes, raw and waste material handling, air contaminant emission sources, quantity or quality, and pollutants, together with their present practical control methods are discussed. Significance of air contaminant emissions from the pesticide industries is evaluated on the basis of available data on the emission quantities and/or toxicity of the pollutant(s) emitted. Gaps in the data required to make a complete evaluation of significance are identified and recommendations to fill those gaps are made.

REFERENCE: EPA, 540/9-75-026, March 1975, pp. 1-85.

657. SEPARATION OF NITROCELLULOSE FIND PARTICLES FROM INDUSTRIAL EFFLUENT WITH ORGANIC POLYMERS

by

Lawrence K. Wang et al.

The polymers in this experiment were used to identify the proper optimum type and dosage needed for an effective treatment. The treatment was for industrial effluent encompassing nitrocellulose fine particles. Results of different contacts were made during this experiment. For example, certain mixing, flocculation, and settling of waste water containing cationic polyelectrolyte and bentonite clay had as high a turbidity as 95%. Contact flocculation filtration was found to not be effective for treating the nitrocelloluse-waste waters. Due to high initial turbidity, chemicals were not effective and contacts failed in efficiency also.

REFERENCE: Canadian Journal of Chemical Engineering, Vol. 60, February 1982, pp. 116-123.

658. A SHORT NOTE ON THE SUITABILITY OF HIGH VISCOUS GRADE FUEL OIL FOR BLENDING COAL TAR CREOSOTE FOR PRESERVATIVE TREATMENT OF TIMBER

by

J. K. Jain and Satish Kumar

This report summarizes experiments with two grades of fuel oil (high viscosity and low viscosity). In these experiments, 10% mineral turpentine was added to the high viscosity oil. This brought the specific viscosity and surface tension down to a level similar to that of low viscosity oil. Absorption and penetration by wood was also tested, and the modified high viscosity oil was shown to be useable as a substitute for low viscosity in wood preservative mixtures.

REFERENCE: Journal of Timb. Dev. Association, Vol. XXVI, No. 1, January 1980, pp. 5-11.

659. SINGLE-DOSE AND REPEATED-EXPOSURE TOXICITY OF A COMPLEX WASTEWATER FROM MUNITIONS MANUFACTURING PLANTS

by

Charles A. Tyson et al.

The wastewater from munitions manufacturing plants, called condensate water (CW), was tested as to its toxicity in animals. Groups of dogs, rats and mice were given various doses of the substance, and then the animals were analyzed, some after one dose and others after repeated exposure to the CW mixture. The chemicals concentrated on, 2,4- and 2,6-dinitrotoluene; both were found to cause harmful effects in each type of animal including compensatory anemia and neurological disorders. A number of other symptoms were also found confirming the obvious danger present in moderate levels of CW concentration.

REFERENCE: Journal of Toxicology and Environmental Health, Vol. 9, No. 4, 1982, pp. 545-565.

660. SINGLE STAGE BIOLOGICAL TREATMENT OF COKE-PLANT WASTEWATERS WITH A HYBRID SUSPENDED-GROWTH-FIXED-FILM REACTOR

by

Bernard W. Medwith and John F. Lefelhocz

Two biophysical treatment systems, one a rotating biological surface; the other a suspended growth system; both of which use powdered activated carbon, were used to reach a goal of 10 milligrams per liter ammonia-nitrogen concentration in coal, coke and power plant wastewaters. However, the high cost associated with constant use and reuse of activated carbon led to the development of a hybrid single-stage suspended-growth-fixed-film bioreactor that uses powdered coke breeze or coal dust as the fixed-film support. This paper outlines this development.

REFERENCE: Proceedings of the 36th Industrial Waste Conference, Purdue University, 1982, pp. 68-76.

661. SOME ASPECTS ON THE SIGNIFICANCE OF HEAVY METALS IN SEWAGE SLUDGE AND RELATED PRODUCTS USED AS FERTILIZERS

by

Arne Andersson

This study determined the average concentrations of a number of heavy metals in manure, which is used as fertilizer. The general effects of the metals on plants were also discussed. Sewage sludge which is to be used in place of manure could be assessed as to its relative heavy metal concentrations. Knowledge of crop characteristics, initial metal concentrations in the soil, and metal concentrations in sewage sludge to be applied may be used to predict effects on crop production.

REFERENCE: Swedish Journal of Agric. Res., Vol. 7, 1977, pp. 1-5.

For articles on related subject see Nos. 193, 206, and 406.

662. SOURCE ASSESSMENT SOLVENT EVAPORATION DEGREASING OPERATIONS

by

T. J. Hoogheem et al.

Described are emission from solvent degreasing and fabric scouring operations: cold cleaning, open top vapor degreasing, conveyor vapor degreasing, and fabric scouring. The potential effects of the hydrocarbonated emissions from these operations were calculated and included in this report. Solvent consumption will increase through 1980 at a rate of 4% per year resulting in a 26% increase in emissions in 1980. However, the same emission standards will be in use in 1980 as were in use in 1974.

REFERENCE: EPA-600/2-79/019f, PB-80-128812, 1979, pp. 1-133.

For articles on related subject see Nos. 407, 408, and 409.

663. STATE OF THE ART OF TEXTILE WASTE TREATMENT

by

Department of Textiles, Clemson University

Methods used on waste treatment in textile industries were studied. The data was gathered from three main sources; the textile industry design of waste treatment plant and regulations from state and federal levels concerning the discharge of wastes into the streams and natural reservoirs. Several subjects discussed in this article were characteristics of textile waste, treatment methods used, the cost of waste treatment operations and effects of textile wastes on receiving water. Suggestions are made in relation to using more up-graded methods of improving waste treatments currently in use at the textile industries. This report relates information about textile industries and their problems, available solutions, and notices of further reading resources. References include reports on synthetic fiber, detergent, instrumentation, plant and water waste manufacturing and treatments.

REFERENCE: EPA Water Pollution Control Research Series, 12090 ECS, February 1971, pp. 1-347.

For articles on related subject see Nos. 454 and 514.

664. STATUS ASSESSMENT OF TOXIC CHEMICALS: ARSENIC

by

S. R. Archer et al.

Arsenic, which is found naturally in metal ore deposits, is produced commercially as a by-product during the processing of nonferrous metal ores. Estimated 1974 consumption of arsenic in the United States was 22,300 metric tons with the sole U.S. producer, the ASARCO copper smelter in Tacoma, Washington, supplying approximately 8,700 metric tons (as arsenic trioxide).

In addition to arsenic trioxide and arsenic metal, there are at least 45 other arsenic compounds of commercial significance produced in the U.S. The largest use of arsenic is in the production of agricultural pesticides, which includes herbicides, insecticides, desiccants, wood preservatives, and feed additives.

It is recognized that atmospheric emissions of arsenic from smelting operations constitute a major pollutant source. Substantial amounts of arsenic escape to the atmosphere from pyrometallurgical copper operations. An estimated 4,500 metric tons of arsenic were released to the atmosphere in 1976 by primary nonferrous smelters; nearly 90% of this total was a result of copper production. Other emissions sources include lead and zinc smelters, glass production plants, coal burning facilities, arsenical compound production plants, and pesticide application. Evidence indicates that disposal of high arsenic-containing wastewater and solid wastes has a potential impact greater than that of air emissions. One veterinary pharmaceuticals plant has been measured with a raw waste loading of 10,000 g/m^3 arsenic and 50 g/m^3 to 60 g/m^3 after treatment.

Since arsenic is a suspected carcinogen, regulations have been or are being established for human exposure in air and water. Two arsenical pesticides have recently had their registrations cancelled. Based upon the information presented in this report, several items should be considered in future studies. Control methods are needed for arsenic fume and fugitive emissions from pyrometallurgical smelter operations, and treatment methods are needed for discharge of high arsenic-containing wastewaters. Production statistics and process information is needed to better understand the production of arsenicals, and fixation and disposal of high arsenic-containing solid wastes should be studied including leaching from existing sites.

REFERENCE: EPA-600/2-79-201b, December 1979.

665. SURVEY OF TAR, HYDROCARBON AND METAL POLLUTION IN THE COASTAL WATERS OF OMAN

by

K. A. Burns et al.

Omani coastal waters was the location of studies conducted over oil pollution. The tankers in operation caused accidental leakage of oil during loading processes. Shellfish analysis was consistent with the chemical analyses of beach tar observations. A definite increase of oil pollution appeared from southern Oman to the Strait of Hormuz. Hydrocarbons of high levels were lacking in the tissue of the Shellfish, and this was visible when the tows were under way and not as much oil was in the water as had been expected. Crude oil seems to be the main pollutant in the Oman seas. The cause of tar to sink comes from the sunlight fractions and photo-chemical condensation. This causes weight in the residues, and therefore, they sink. Through analyses it was important to have differentiating hydrocarbons for essential data interpretations. Other important factors would be a selection of species of Shellfish. Further investigation was suggested to be conducted.

REFERENCE: Marine Pollution - Bulletin, Vol. 13, No. 7, 1982, pp. 240-247.

For articles on related subject see Nos. 8, 411, 418, and 516.

666. SYSTEMATIC APPROACH TO THE STUDY OF AROMATIC HYDROCARBONS IN HEAVY DISTILLATES AND RESIDUES BY ELUTION ADSORPTION CHROMATOGRAPHY

by

D. M. Jewell et al.

Modifications of techniques used in the isolation of heavy hydrocarbons from heavy distillates and residues were tested. Elution adsorption chromatography accompanied by multiple on-line detectors was the specific technique discussed for hydrocarbon classification. This method has proven satisfactory in testing kerosene, cracked or virgin gas oils, FCC feedstock and residuals. The system was found to be valuable in analyzing acids, bases, neutral nitrogen compounds, total saturates, total aromatics, monoaromatics, di + triaromatics and polyaromatics.

REFERENCE: Analytical Chemistry, Vol. 44, No. 14, December 1972, pp. 2318-2331.

667. TEXTILE DYEING WASTE WATERS: CHARACTERISTICS AND TREATMENT

by

Roderick H. Horning

Twenty textile systems were selected as a good crossection of differences in textile waste water treatments. The waters from these systems were analyzed raw and treated with all results included. The types of treatments were biological, chemical, and physical. Also statistical work-ups on heavy metal content in dye baths are presented along with lists of dye bath additives and dyeing methods.

REFERENCE: EPA-600/2-78-098, PB 285-115, 1978, pp. 1-312.

668. THERMAL STABILITY OF ASPHALTENES

by

Jose O. Hernandez and Eduardo Chroen

This paper presents results of the application of thermal analysis techniques to asphaltenes from Venezuelan oils, with the purpose of creating their contribution to the volatile and residual parts of the organometallic compounds. To extract asphaltenes from crude oils, the procedure used was a determinant factor on their properties. There were two main methods used to separate asphaltenes from resin and oils. One method was by precipitation with perchloric acid from a toluene-acetic acid dispersion. The other method used aliphatic hydrocarbons as selective solvents. The asphaltenes were taken from six different heavy crude oils. They are Lagunillas, Bachaquero, Tia Juana, Boscān, MeLones and El Pao. The results showed that the content of asphaltenes in crude oils has no relation to API gravity. Also, between 35 to 60% of vanadium content in crude is asphaltenic vanadium. All the oils showed similar thermal behavior, but the vanadium complexes in the Boscān asphaltenes have a greater thermal stability.

REFERENCE: American Chemistry Society, Division of Petroleum Chemistry, Vol. 24, No. 4, 1979, pp. 1009-1013.

669. TOXIC POLLUTANTS CONTROL: PROGRESS AT LAST

by

P. S. Wood

This report discussed the implementation of a toxic pollutant act proposed by the EPA. One section which dealt with toxic pollutant standards was found to contain a number of flaws. The problems with this particular section were eventually solved by placing the majority of toxic waste regulations under other sections of the act.

REFERENCE: Journal WPCF, Vol. 49, No. 1, 1977, pp. 6-9.

670. TOXICITY REMOVAL IN TEXTILE PLANT WASTE WATERS

by

Gary D. Rawlings and Daryl G. DeAngelis

This is the first of a two-part report which is designed to determine the toxicity of textile plant waste waters and efficient treatment processes for the waste. This paper acts as an introduction to the project and gives primary objectives of the study. Samples of various waste were analysed and categorized by the presence of certain priority pollutants and by relative toxicity. Various plant sites which produce effluents containing high pollutant concentrations were selected to study the reduction in toxicity by selected tertiary treatment waste water controls.

REFERENCE: JALCA, Vol. 74, 1979, pp. 404-417.

For articles on related subject see Nos. 195, 196, and 422.

671. TREATMENT OF A WOOD PRESERVING EFFLUENT CONTAINING PENTACHLOROPHENOL BY ACTIVATED SLUDGE AND CARBON ADSORPTION

by

B. E. Jank and P. J. A. Fowlie

This study was designed to provide information to help determine the best practicable technology (BPT) for treating wood preserving effluent. This data was used to help develop regulations concerning waste discharge. Data was gathered from three different procedures: 1. modifying the previously used activated sludge system, 2. using the activated sludge system in association with a granular activated carbon column system, and 3. the sole use of the activated carbon system without the activated sludge treatment. The second phase utilizing both systems along with oil removal and flow equilization technology was the preferred method for pentachlorophenol (PCP) removal.

REFERENCE: Proceedings of the 35th Industrial Waste Conference, Purdue University, pp. 63-79.

672. THE TREATMENT OF CADMIUM PLATING WASTEWATERS BY ACTIVATED CARBON ADSORPTION

by

Chin-Pao Huang et al.

Because of the potential hazards of excess cadmium in the environment, this study was conducted in an attempt to develop a new treatment method for cadmium containing wastes. Activated carbon adsorption was studied with model systems of cyanide and fluoborate baths. Enhanced cadmium removal by activated carbon pretreated with carbon disulfide was also assessed. The factors found which most critically affected cadmium adsorption included carbon type, pH, carbon dose/cadmium (II) concentration and ionic strength. The process overall showed an appreciable level of cadmium removal near the neutral pH level in a short period of time.

REFERENCE: National Conference on Environmental Engineering, 1979, pp. 375-382.

673. TREATMENT OF COAL COKING AND COAL GASIFICATION WASTEWATERS

by

Richard G. Luthy

This study discussed the biological oxidation of coal refinery effluents. Results are given of water pretreatment by solvent extraction, ammonia stripping and biological treatment techniques. Experimental results were used for the engineering and design of a basic biological treatment system. Also determined were biological growth constants and removal efficiencies for various contaminants. Contaminants which were adequately controlled include BOD, COD, phenolics, ammonia-nitrogen and cyanogen-nitrogen. Most of the treatments resulted in relatively low microbial yields. Results also showed that single stage nitrification was also a feasible method under certain circumstances.

REFERENCE: Journal WPCF, Vol. 53, No. 3, March 1981, pp. 325-339.

674. TREATMENT OF COKE PLANT WASTEWATER USING PHYSICAL-CHEMICAL AND BIOLOGICAL TECHNIQUES

by

Richard Osantowski and Anthony Geinopolos

Pilot studies were performed concurrently at two coke plants to investigate the effectiveness of physical-chemical and biological treatment in meeting steel industry BAT (Best Available Technology) Guidelines for the by-product coke making subcategory.

REFERENCE: Proceedings of the Symposium on Iron and Steel Pollution Abatement November 1980, EPA 600/9-81-017, 1981, pp. 379-394.

675. TREATMENT OF TEXTILE WASTEWATERS IN A BIOLOGICAL-CHEMICAL SYSTEM

by

Thomas N. Sargent and Thomas L. Rinker

A report concerning activated sludge in the biological aspect and alum coagulation in a chemical sense were tested in a synthetic fabric dyeing and wastewater treatment. In order for treatment to be conducted on these fabrics, an industry was selected. Blue Ridge-Winkler (BRW) was one such place for producing basically natural fabrics where particular types of wastewater could also be examined. Wastewater characteristics were selected and equilized for physical and chemical values. General description, equalization, and the activated sludge treatment were all correlated in response to wastewater treatment. During the performance of data operations, there were break-downs in the mechanics, but a separate table of summaries was submitted in order to compare data. In order to summarize a cost for the operation, water volume and total pounds were used to conclude 360,000,000 gallons of water volume and 30,000,000 pounds were utilized.

REFERENCE: EPA Environmental Research Lab, Athens, Georgia, pp. 1-20.

676. TREATMENT OF WATER AFTER HYDRAULIC UNLOADING OF COKE

by

N. T. Pokhodenko et al.

A two stage method of coke unloading by hydraulic means is explained. This procedure results in the production of large quantities of wastewater containing suspended coke particles. The size and concentration of suspended coke particles was measured at different stages of treatment. The wastewater is normally treated and recirculated for further use. The use of a settling tank with a filter bed appeared to be the most desirable treatment method. This system would reduce suspended matter to the degree that essentially no corrosion of equipment would result.

REFERENCE: Bashkir Scientific-Research Institute for Petroleum Processing
Translated from Khimiya i Tekhnologiya Topliv i Masel, 1979,
pp. 291-295.

677. TREATMENT OF WATER CONTAINING CYANIDE

by

Wendell N. Christensen and Larry W. Poulter

Sodium chloride is added to water which is then passed through at least one electrolytic cell. There, electrolysis of the sodium chloride produces chlorine molecules and sodium hydroxide. The water then flows into the presence of metal-cyanide comtaminants. The chlorine and caustic immediately react with the metal-cyanide compounds to produce metal hydroxide precipitates, while the cyanide is decomposed and liberated from the water in carbon dioxide and gaseous nitrogen. As part of this reaction, the sodium chloride is reformed, so that the same brine can be recycled and the process repeated without further additives. The optimum pH of between 7 and 8 may be maintained as needed by addition of small amounts of hydrochloric acid to the system.

REFERENCE: United States Patent, No. 4,029,557, June 14, 1977.

678. TWO-STAGE BIOLOGICAL TREATMENT OF COKE PLANT WASTE WATER

BY

Richard Osantowski et al.

The report documents a pilot-plant study of the use of advanced waste treatment methods in upgrading metallurgical coke making waste waters to Best Available Technology (BAT) levels. Mobile treatment units, operable at a flow rate of 19 l/min, were used. Methods used included two-stage activated sludge treatment for removal of organic carbon compounds and ammonia; filtration and activated carbon were also studied as polishing steps. For each treatment studied, samples (including toxic pollutants) and operational data were obtained for later use in assessing and comparing treatment adequacy. The study showed that high levels of organic pollutant removal were achieved in the 1st stage of biological oxidation. Abnormal operating conditions in the coke plant waste water pretreatment system during the testing resulted in ammonia levels as high as 2000 mg/l, making it necessary to dilute the 2nd stage feed before nitrification could be achieved. Ammonia reductions of > 97% were achieved in the 2nd stage. Activated carbon and filtration effectively removed suspended solids, total organic carbon, color, and thiocyanate.

REFERENCE: EPA, 600/2-81-052, April, 1981, pp. 1-244.

679. ULTRAFILTRATION/REVERSE OSMOSIS RECYCLE SYSTEM FOR WOOD PRESERVING INDUSTRY

by

Allen Shum and Richard Brown

This program deals with information compiled during the start-up and adjustment phase of a wood preserving plant operation to incorporate a wastewater recycle system.

The design of the completed treatment system is principally based on the technology of three systems of separation; that is, equipment is provided for the removal of contaminants from the wastewater stream successively by primary filtration, ultrafiltration and reverse osmosis. Moreover, facilities are also incorporated for the recycling of the treated water.

Although the treated water may be used as boiler feed water, this demonstration project indicated that filtration is not an economical secondary treatment system for wood preserving wastewaters. Other developments for pretreatment are needed to diminish various fouling characteristics of wastewater to extend life of the reverse osmosis unit. Discussions on attempts at pretreatments and alternatives are included in the report.

This report was submitted in fulfillment of Grant No. S805179 by Pacific Wood Treating Corporation under the sponsorship of the U.S. Environmental Protection Agency. It covers a period from July 15, 1977, to December 14, 1981, and work was completed as of October 14, 1980.

REFERENCE: EPA, Grant No. S-805179, pp. 1-5.

680. ULTRAFILTRATION SYSTEM FOR LATEX PAINT WASTEWATER TREATMENT

by

Audrey Chou Wykpisz

This was a pilot study conducted to determine, the feasiblity of using an ultrafiltration system for the treatment of latex paint wastewater. The system appeared to be an adequate means of waste polishing; however, because of the high cost of the system, it was not competitive with previously used methods.

REFERENCE: Proceedings of the Industrial Waste Conference, Vol. 35, 1981, pp. 416-424.

681. WASTE OIL RECYCLING AND DISPOSAL

by

N. J. Wienstein

The sources and amounts of waste oils, present and future, recycling and disposal methods and their environmental impact was developed by literature search and surveys of oil related industries. The elaborations of this data are in this report.

REFERENCE: PB-236-148, EPA-670/2-74-052, 1974, pp. 1-327.

For articles on related subject see Nos. 208, 426, 428, 429, 432, and 433.

682. WASTE WATER TREATMENT METHOD

by

Jack F. Tate

A method of disposing of certain process effluent waste streams by injecting them into subterranean formations which entails inhibiting the formation of solid precipitates which plug the subterranean formation. The method of inhibiting the formation of precipitates involves lowering the pH of the mixed streams by optionally removing any organic phase created thereby before injection.

REFERENCE: United States Patent Office, No. 3,817,859, June 18, 1974.

683. WESTERN ELECTRIC BUILDS MODERN PLANT FOR TREATING METAL FINISHING WASTES

by

S. F. O'Connor et al.

Several aspects of a Western Electric waste treatment are discussed. This plant concentrates on metal finishing wastes, while somewhat smaller amounts of several other wastes are also treated. The facility treats such wastes as acid-alkali wastes, chromium waste, cyanide and combined wastes using neutralization, oxidation, reduction and solids removal and dewatering procedures. One aspect of the system is the potential use of reclaimed water. Other than waste segregation problems, the system has existed as an effective means of producing a sufficiently purified effluent.

REFERENCE: Water and Wastes Engineering/Industrial, Vol. 6, No. 7, July 1969, pp. D-16 - D-19.

684. WOOD PRESERVATION PROCESS

by

John Schroder

A wood treatment process is presented utilizing either water-borne or air-borne preservatives. Procedures are given including sterilization, forcing water out of the wood by stream pressure, and the application of the preservative to the wood. The preservative is a copper/chrome/arsenic solution to prevent the precipitation of salts. One major aspect of this procedure is the presence of sulphuric acid in the solution to keep pH levels sufficiently low.

REFERENCE: Australian Patent WO 82/01848, June 10, 1982, pp. 1-16.

For articles on related subject see Nos. 201 and 435.

685. APPROXIMATIONS FOR VERTICAL INFILTRATION RATE PATTERNS

by

Robert E. Smith

A history of time-varying surface-soil infiltration rate approximation formulas and models ranging from simple two and three variable formulas on up to complex computer models involving several variables pertinent to greater accuracy in approximation of infiltration rates are discussed in this report. Utilization of these approximations is linked to the assumptions used in any formula or model and the error produced or reduced by judicious screening of these assumptions as related to their accuracy.

REFERENCE: ASAE, #75-2010, 1975, pp. 1-17.

686. ASSESSMENT OF WATER LOSS PATTERNS WITH MICROLYSIMETERS

by

A. S. Rogowski and E. L. Jacoby, Jr.

This paper studies ways to develop a practical method of experimentally evaluating evapotranspiration (ET) in the field and to examine the water loss patterns on a watershed where predominant rooting depth was about 30 cm. Distribution of evapotranspiration in the field is often difficult to measure because of many soil types, moisture regimes, and vegetation types. The experiments were carried out with the use of lysimeters, portable cylindrical; and grass lysimeters were used to find the distribution patterns of ET. The microlysimeters were used in laboratory and field studies, and the final stage was obtained from a 58-ha watershed. In the laboratory, the results showed at high soil water despite periodic removal for weighing; the continuity of flow was preserved and seemed to reestablish itself after each interruption. The field experiment showed no important differences in ET between segments of a small study area and demonstrated feasibility in field use. The watershed study contained gamma-probe measurements and ET prediction with an ET model. The three studies proved to be fair except for a very stoney and a wooded area.

REFERENCE: Agronomy Journal, Vol. 69, May-June 1977, pp. 419-424.

687. CONSTRUCTION AND PERFORMANCE OF LARGE AUTOMATIC (NONWEIGHING) LYSIMETERS

by

G. A. Reichman et al.

This report discusses the construction of twelve lysimeters. The use of automatic water tables controls the lysimeters function. Hecla loamy fine sand replaced natural soil, and time clocks were installed. The system bettered losses up 2 cm during a 24 hour period. Excess water was also removed up to 4 cm in the same amount of time. Presently, data shows satisfactory function of the nonweighing lysimeters and the controlled water tables.

REFERENCE: Transactions of the ASAE, 1979, pp. 1343-1346.

688. DEVELOPMENT AND INSTALLATION OF A SIMPLE MECHANICAL WEIGHING TYPE LYSIMETER

by

S. P. Bhardwaj and G. Sastry

Lysimeters were made from natural materials which were light weight. There are four components that make up the assembly: the concrete structure, platform weigher, tank for the lysimeter and a retaining tank. Within the lysimeter tank (120 cm cube) is a system for measuring runoffs and seepage losses. Soil monolith and support bridges are two other components of the lysimeter. Even in the remotest of areas, the system is easily suitable for budgeting and evapotranspiration studies.

REFERENCE: Transactions of the ASAE, 1979, pp. 797-802.

689. ET ESTIMATES WITH THE MODIFIED PENMAN EQUATION

by

E. Gordon Kruse et al.

This report discussed the accuracy of using the modified Penman equation for the estimation of plant evapotranspiration (E_t). Another modification which would consist of revising corn crop coefficients was also suggested for more accurate results in future tests. Estimates, which were derived from solar radiation amounts, along with several other variables were then compared with measured E_t values. Some deviation between estimated and actual values were noticed when corn plants were studied, while values for alfalfa E_t coincided closely with each other. The study concluded that this method gave adequate estimates for irrigation and scheduling purposes.

REFERENCE: Proceedings of the ASCE Irrigation and Drainage Division, Specialty Conference on Water Management for Irrigation and Drainage, July 20-22, 1977, pp. 245-255.

690. AN ECONOMICAL HYDRAULIC LYSIMETER--CONSTRUCTION AND CALIBRATION

by

Ram K. Gupta

This paper shows results on the construction and calibration of a low cost lysimeter with a sensitive weighing device. The lysimeter has proved to be a very useful tool for evapotranspiration studies; it provides continuous measurements of water loss from the soil and the growing plants it contains under field conditions. The lysimeter, which is composed of a locally fabricated hydraulic load cell for the weighing device, a coconut oil drum as the inner tank which is filled with soil, and a read out system with a provision to read weight changes in six lysimeters, cost almost four hundred rupees (equivalent to .13 of the U.S. dollar). The lysimeter is susceptible to 100 g (equivalent to 0.04 mm of water). The lysimeter appears to be a promising experimental technique for studying different aspects of evapotranspiration and water balance for different crops grown, under different microclimatic conditions. The main features of assembly are low cost, easy fabrication, simple and convenient operation and fairly good precision.

REFERENCE: Journal of the Indian Society of Soil Science, Vol. 21, 1973, pp. 377-381.

691. AN ECONOMICAL HYDRAULIC WEIGHING EVAPOTRANSPIRATION TANK

by

A. S. Dylla and L. M. Cox

In collecting evapotranspiration data, several types and sizes of lysimeters have been used. Even though the nonweighing tank is merely economical and is less limiting as to size that may be constructed, the weighing-type tank allows more accurate determination of soil moisture changes, or evapotranspiration, over shorter periods of time. Weighing tanks range from pick-up-and-weigh to the sophisticated electronically recording weighing scales. One study on a hydraulic pillow supported evapotranspiration tank revealed temperature drift. The temperature problem was attempted to be corrected by using a standpipe manometer. Readings from the tanks showed the standpipe indicated to be somewhat erratic. Some hydraulic weighing tanks used the butyl tubing-supported tank and weighing system. The results showed that water-filled butyl irrigation tubing provided a flexible supporting pad that tends to resist imbalanced loads. The cylindrical tank also conforms easily to taking undisturbed and vegetated soil monoliths.

REFERENCE: Transactions of the ASAE, 1973, pp. 294, 295, and 301.

692. FIELD TEST OF SOIL WATER FLUX METERS

by

Christiaan Dirksen

The drainage flux of soil waste was measured by using hydraulic resistant flux meters. The resistance changes with the adjustment in the soil. Therefore, the soil water flux and the meter are equal, and results can be retained from the calibration of the resistance. At times the match is not perfect, so the leftover samples of divergence or convergence flow are calculated a part from the flux set up in the soil. By installing the meters horizontally, the soil fluxes were undisturbed while measurement was taken. With the aid of a spring, the plates were put in place allowing movement of the meters at any time. In this test, two different sized fluxes were used and both gave satisfacotry results.

REFERENCE: American Society of Agricultural Engineers, Paper No. 74-2039, June 23-26, 1974, pp. 1-12.

693. FREQUENCY OF POTENTIAL EVAPOTRANSPIRATION RATES IN CENTRAL GREAT PLAINS

by

Norman J. Rosenberg

In Mead, Nebraska at the University of Nebraska's Evapotranspiration Research Facility, studies are being directed toward the development of test methods for increasing the water use efficiency of crops grown under irrigation. With very accurate lysimeters, daily evapotranspiration are measured, but very little evidence on daily rates is available from these studies yet. Nevertheless, a brief look of the data into probability form may help supply information needed for engineers on the nature of irrigation water demand in one large region of the country from which no other lysimetric data are available.

REFERENCE: Journal of the Irrigation and Drainage, July 1972, pp. 203-206.

694. HYDRAULIC LOAD-CELL LYSIMETER, CONSTRUCTION, CALIBRATION, AND TESTS

by

T. A. Black et al.

This paper describes the construction and calibration of two 35-metric ton, hydraulic load-cell lysimeters that contain suction drainage systems. Capacity pressure transducers measure the pressures, and it was found that butyl-nylon load cells contain an ethylene cool-water mixture. The sensitivity of the lysimeter is 0.02 of evaporation. The evaporation measured daily from the lysimeter and two independent micrometerological methods agreed within a short range. Lysimeter measurements of evaporation, taken on a normal June day, showed bare soil lagged measurements using the two other methods by not quite 1.5 hours. The reason for the soil lag measurement was because of differences between lysimeter thermal regime and the surrounding soil. It was found that thermal regime differences could be minimized by the use of foam plastic insulation of the tank walls. The production of the lysimeter appears to be adequate under the difficult conditions of this test, and it is anticipated that less thermal error will occur when used under vegetation.

REFERENCE: Soil Science Society American Proceedings, Vol. 32, 1968,
pp. 623-629.

695. IMPROVEMENTS IN THE VAN BAVEL-MYERS AUTOMATIC WEIGHING LYSIMETER

by

Norman J. Rosenberg and K. W. Brown

Three modifications were made on each of two weighing lysimeters installed at Mead, Nebraska to correct problems that affected the accuracy and performance of the instruments. The modifications were: making the underground parts drainage to keep them water free; moving the electrical junction of the strain gage load cell to maintain the high resistance between the cell and the ground; relocating the mechanical damping unit for easier accessibility.

REFERENCE: Water Resources Research, 1970, pp. 1227-1229.

696. INFILTRATION AND WATER DEPLETION IN LYSIMETERS

by

Hasan K. Qashu

This study examines an attempt to present and describe water use by five plant species grown in lysimeters and to discuss influence of vegetation on some elements of the hydrologic cycle. Prediction equations were imposed and used to estimate soil water regimens, infiltration, and runoff in lysimeters with vegetative cover. The study indicated that the procedure of measuring the elements of water balance is useful in areas with limited data. As physical meaning of the cause and the effects in surface water/soil water continue, hydrologic relations must be obtained through a mathematical analysis of a time-varying system. For evaluation of two elements, runoff and water storage in the hydrologic cycle derived equations for estimating soil water depletion and infiltration predictors are very useful first approximations. They disclose the importance of vegetation, particularly plant species, as a principal factor in the rainfall-runoff process.

REFERENCE: Soil Science Society American Proceedings, Vol. 33, 1969, pp. 775-778.

697. IRRIGATION CONTROL USING TENSIOMETERS AND SALINITY SENSORS

by

J. D. Oster et al.

This study discussed the use of salt sensors and tensiometers in maintaining the leaching fraction of high frequency irrigation systems. This control system was based on comparisons with experimental measurements. Also established were appropriate sensor-placement depths and control levels. These figures were found to vary considerably with low rather than high frequency irrigation. The feasibility of this type of project will depend on several factors which are still under consideration. These include the following: 1. effects of water application on control sensor location, 2. the predetermination of number, location and depth of control sensors, and 3. the effectiveness and cost of a totally automated control system.

REFERENCE: Transactions of the ASAE, 1976, pp. 294-298.

698. LABORATORY STUDY OF THE BEHAVIOR OF A SANITARY LANDFILL

by

A. A. Fungaroli and R. L. Steiner

This paper provides a description of a portion of an experiment of sanitary landfills in a temperate, humid environment. The main objective of the study deals with the interrelationships between sanitary landfills, the physical environment and surface and groundwater. A simulated sanitary landfill and a field landfill are the study areas. The focus of this article is the simulated landfill in the form of a lysimeter. Lysimeter design specifications include minimal heat exchange across the vertical walls, controlled climate, amount of refuse, tank size, composition of refuse, refuse component size, controlled moisture, and soil cover and refuse density control. The environment control system includes a top air temperature control, water application system, bottom air space temperature control, insulation of vertical tank walls, and heat flow out of the lysimeter. Instruments in the lysimeter monitor temperatures and gas samples. Refuse composition and placement is representative of typical domestic refuse. Results of the lysimeter experiment and the temperatures of the lysimeter are discussed. Various qualities and composition of the leachate are discussed in great detail.

REFERENCE: Journal WPCF, Vol. 43, No. 2, February 1971, pp. 252-267.

699. A LARGE, UNDISTURBED, WEIGHING LYSIMETER FOR GRASSLAND STUDIES

by

Joe D. Armijo et al.

This article outlines the design, installation, operation, and costs of a lysimeter used in a delicate prairie grassland. Due to the nature of the prairie grassland, a lysimeter that could be installed and operated with as little disturbance as possible to the soil was designed. The "undisturbed" feature allows for greater accuracy in measuring evapotranspiration in natural circumstances, and the apparatus worked beyond the design expectations.

REFERENCE: Transactions of the ASAE, 1972, pp. 827-830.

700. LYSIMETER AND WATERSHED EVAPOTRANSPIRATION

by

Seppo E. Mustonen and J. L. McGuinness

Estimations of evapotranspiration from watersheds were developed from data from weighing lysimeters. It was shown that evapotranspiration from lysimeters was greater than that of corresponding watershed evapotranspiration measurements, but these differences may be reduced in time with advances in lysimeter technology. The prediction equations developed were useable throughout the year in the case of lysimeters, but ground cover type coefficients had to be used when watershed areas were considered. The equations were based on lake evaporation, soil moisture, and precipitation.

REFERENCE: Water Resources Research, Vol. 3, No. 4, 1967, pp. 989-996.

701. LYSIMETER SYSTEM CHECK

by

J. E. Middleton

This lysimeter provides a quick dynamic sensitivity check as opposed to the static weight procedure. Certain malfunctions can be indicated by this new method. This method can be used on various types of readout systems. Calibration can be achieved during the check procedure.

REFERENCE: Agricultural Engineering, July 1972, pp. 14-15.

702. A LYSIMETER SYSTEM FOR WATER TABLE CONTROL

by

S. P. Shih et al.

This study examined the construction and evaluation of lysimeters for controlling the water table. Evaluations were made on techniques of average values, standard deviation, and outflow responses to excess rainfall. Materials and dimensions of the lysimeters were discussed along with their cost. Water table control was acceptable with a low standard deviation. This system was concluded as being a cost efficient and effective lysimeter design for controlling water table levels.

REFERENCE: American Society of Agricultural Engineers, 1977, pp. 1-15.

703. PAIRED HYDRAULIC WEIGHING LYSIMETERS FOR EVAPOTRANSPIRATION MEASUREMENT

by

D. C. Kincaid et al.

Errors in measurement of evapotranspiration by lysimeter can be reduced. This lysimeter system reduces errors by incorporating two inner tanks, each having its own independent hydraulic weighing apparatus in one outer tank.

REFERENCE: American Society of Agricultural Engineering, Paper No. 79-2513, 1979, pp. 1-7.

704. RATIO BETWEEN EVAPOTRANSPIRATION FROM LYSIMETERS AND EVAPORATION FROM SMALL EVAPORIMETERS USING 2- AND 3-HOUR PERIODS OF MEASUREMENT

by

J. C. Wilcox and W. K. Sly

Measurements of evaporation were taken from two kinds of evaporimeters and evapotranspiration from lysimeters including bromegrass. Soil moisture and content was under surveillance every 2 or 3 hours from dawn to dusk. The contents were kept at a 100 to 60% water capacity during the testing. Polynomial regression was shown by an increase in potential evapotranspiration and evaporation. The main effect toward regression is apparently from light on the stomatal opening. Evaporation and potential evapotranspiration had no diurnal effects as far as temperature, wind or dew were concerned.

REFERENCE: Canadian Journal Plant Science, Vol. 54, March 18, 1974, pp. 559-564.

For article on related subject see No. 36.

705. REMOTE SOIL-WATER SAMPLING TECHNIQUE

by

R. W. Wengel and G. F. Griffin

A modification of commercial soil-water samplers are used (small diameter tubing and a taggle value) for remote sampling. There are three advantages to remote sampling. These advantages include the elimination of soil compaction due to traffic at the site, the ability to sample frequently and/or repetitively, and the lessening of intersample contamination due to residual solution in long lines. A discussion and description of techniques and equipment are included in the article.

REFERENCE: Soil Science Society American Proceedings, Vol. 35, 1971, pp. 661-664.

706. SOIL MOISTURE TENSION TRANSIENTS ASSOCIATED WITH EVAPOTRANSPIRATION FROM A WATER TABLE

by

W. C. Bianchi and Rhys Tovey

Lysimeters completed recordings of soil moisture tensions containing loam soil and having a controlled water table. Several strain gauge-pressure transducer-tensiometers were placed at different levels from 20 to 110 cm above a 158 cm water table. Moisture was inconsistent in velocity of morning and evening moisture tension progression. This interpretation came from results of low tension decreasing in moisture film continuity between soil and tensiometer bulbs. These were relative to the few roots in contact with the bulbs. This caused measurements to be biased toward tensions linked with the root system. It was then discovered when daily tension went over 400 cm of water, soil-bulb continuity was lost. This caused the normal wave form of daily evaporation demand to be lost. By putting the tensiometers in the root absent from capillary fringe to record changes of evaporation, results could be tested. The testing method for analyzing water table uptake was based on velocity of the tension waves caused by soil profile evaporation.

REFERENCE: Soil Science Society of America, Vol. 34, No. 3, 1970, pp. 496-501.

707. SOIL-WATER SAMPLING USING PAN AND DEEP PRESSURE-VACUUM LYSIMETERS

by

Richard R. Parizek and Burke E. Lane

Two types of lysimeter systems are reviewed and compared. The upgraded pressure vacuum could sample down to 50 feet and the sampling duration can be extended 2 months beyond the usefulness of a pan lysimeter system, but cannot sample bacteria or suspended particles. On the other hand, pan lysimeters (trench systems) can only sample gravitational and perched ground water.

REFERENCE: Journal of Hydrology, Vol. 11, 1970, pp. 1-21.

708. A TECHNIQUE USING POROUS CUPS FOR WATER SAMPLING AT ANY DEPTH IN THE UNSATURATED ZONE

by

Warren W. Wood

This paper describes an improved design of the Parizek-Lane system that allows the collection of water samples at any certain depth, saturated or unsaturated. A check value in the cup assembly prevents pressurization of the porous cup. This type of structure allows an entire collection at any depth without the loss of samples. An improvement over past designs is illustrated by a detailed description of construction and operation.

REFERENCE: Water Resources Research, Vol. 9, No. 2, April 1973, pp. 486-488.

709. UNSATURATED FLOW PROPERTIES USED TO PREDICT OUTFLOW AND EVAPOTRANSPIRATION FROM A SLOPING LYSIMETER

by

David G. Scholl and Alden R. Hibbert

To determine the moisture flux, hydraulic gradients, and dynamic conductivity of a soil lysimeter, field measurements were used to find the soil moisture content and pressure potential. To find the soil content and pressure level, the moisture flux, hydraulic gradients, and dynamic conductivity were used for the determination of results. Outflow and evapotranspiration were then determined from the measurements. During the first phase of analysis, evapotranspiration was eliminated by shutting off the surface with a sheet of plastic. Moisture flux was determined by the change in depth and time. These results correlated with the outflow measurements. Evapotranspiration was solved by the second study phase when the plastic sheet was removed and grass was put in place. The results from the lowest level in the profile did agree with the actual outflow.

REFERENCE: Water Resources Research, Vol. 9, No. 6, December 1973, pp. 1645-1655.

710. USE OF A LABORATORY LYSIMETER TO DETERMINE SOIL MOISTURE TRANSPORT PROPERTIES

by

H. D. Scott

This paper looks at the report on the classroom-laboratory use of a lysimeter instrumented with tensiometers and access tubes to determine the capillary conductivity, soil waste diffusivity, and soil bulk density. The technique used a slight modification of the in situ capillary conductivity method given by Rose, Stern, and Drummond. The technique has several advantages over previously used classroom-laboratory techniques. These include the use of relatively inexpensive materials, some additional related experiments, having students use radiation instruments for experience in calculating soil water fluxes, and readily accessible reading could be obtained. The major disadvantage seems to be the number of calculations required.

REFERENCE: Journal of Agronomic Education, Vol. 4, August 1975, pp. 28-32.

711. THE USE OF LYSIMETERS IN THE HYDROLOGICAL INVESTIGATION OF THE UNSATURATED ZONE

by

G. Kovacs

Experimental basins are frequently used for data over surface runoff origination from precipitation. To avoid difficulty in finding data, lysimeters were installed in soil moisture zones for experimental analysis. Lysimeters are experimental areas in themselves and are used to study water balance and the effect on soil moisture zones. The investigation during surface runoff has to be directly measured data for acceptable evaluation. Therefore, it is necessary to distinguish the different types of lysimeters. Some parameters can be measured directly, while others must be calculated through different methods.

REFERENCE: Hydrological Sciences, Vol. 21, December 1976, pp. 499-516.

For articles on related subject see Nos. 433, 435, and 519.

712. CONTINUOUS SUBSURFACE INJECTION OF LIQUID DAIRY MANURE

by

J. L. Smith et al.

This research involved developing and evaluating a subsurface injection machine. It was found to be economically feasible compared to other methods. Injection of liquid dairy manure caused environmental effects, soil salinity to increase, and fecal coliform moved to ground water. Both of these problems can be eliminated by proper management and site selection.

REFERENCE: EPA-600/2-77-117, PB 272-350, 1977, pp. 1-56.

For articles on related subject see Nos. 20, 21, 22, 45, 48, 49, 137, 152, 234, and 255.

713. DISPOSAL OF PULP AND PAPERMILL WASTE BY LAND APPLICATION AND IRRIGATIONAL USE

by

I. Gellman and R. O. Blosser

Physical soil characteristics, microbial activity, organic decomposition in soil, current and growth of supplemental irrigation practices, and water salinity and quality for irrigation are aspects to be considered and important in studying land disposal of mill effluents. Eighteen mills were also studied and all report summaries are included.

REFERENCE: Proceedings of the 14th Industrial Waste Conference, Purdue University, Vol. 104, 1959, pp. 479-494.

For articles on related subject see Nos. 24, 61, and 155.

714. EFFECT OF LONG TERM LAND DISPOSAL BY SPRAY IRRIGATION OF FOOD PROCESSING WASTES ON SOME CHEMICAL PROPERTIES OF THE SOIL AND SUBSURFACE WATER

by

D. C. Adriano et al.

Subsurface waters of two varieties, perched and groundwater, were monitored at daily and monthly intervals. These waters were taken from two irrigated land disposal sites of food processing waste waters. Samples of soil profiles were taken up from depths of up to 6.6 meters. Calculated inputs of 487 kg/ha of total nitrogen and 101 kg/ha of soluble orthophosphate were taken from cannery wastes yearly from site one. From site two, 562 kg/ha total nitrogen and 522 kh/ha orthophosphate were selected and analyzed. Nitrate ranged in subsurface waters at 7 to 16 ppm from the first site. Groundwaters from site 2 ranged from 2 to 41 ppm. Nitrate was analyzed as stable in percolation streams below root zone level. While major irrigation input was carried out, nitrate was found in levels above public health standards in the surface waters. Passing environment standards was PO_4 on a regular basis except when discontinued during the winter. Residual accumulation rate in soil could have been lowered by harvest removal to help materially extend the life of these systems.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 2, 1975, pp. 242-248.

For articles on related subject see Nos. 61, 158, and 161.

715. LAND DISPOSAL OF POTATO STARCH PROCESSING WASTE WATER IN THE NETHERLANDS

by

F. A. M. de Haan and P. J. Zwerman

The feasibility of disposing of potato starch processing waste water by land disposal methods was studied. The report emphasized the amount of water which can be purified by the soil. The utilization of nutrients by plants and the effects of waste applications on farm economics were also discussed. This research was instituted in an attempt to prevent surrounding waters from being further contaminated. Applications to sandy soil resulted in complete oxygen demand removal, while peaty soils were somewhat less effective. Land disposal of this type of waste water was shown as being an economical form of waste treatment.

REFERENCE: Agronomy Paper, No. 1008, 1972-1973, pp. 222-228.

For articles on related subject see Nos. 62, 70, 71, 76, 81, 84, 303, 333, 483, and 607.

716. LAND DISPOSAL OF WASTEWATER IN HAWAII

by

Gordon L. Dugan et al.

This project was undertaken to determine if secondary treated effluent waste water could be used to irrigate or to supplement irrigation of sugar cane. During a two year study, both of these ideas were tested and supplemental irrigation of the cane was found to be the most desirable.

REFERENCE: Journal WPCF, Vol. 47, No. 8, 1975, pp. 2067-2087.

For article on related subject see No. 338.

717. LAND TREATMENT OF WASTERWATER--TECHNOLOGY WITH EXCITING POTENTIAL

by

Nora Goldstein

This report describes three wastewater treatment systems, two of which are in operation and one in the final stages of construction. The operations are utilizing land treatment as their man source of waste disposal. The descriptions include facilities, design and costs as compared to advanced wastewater treatment (AWT). In each case, land treatment irrigation with wastewater was perferable over (AWT) because of overall cost and disposal efficiency.

REFERENCE: BioCycle, January/February 1981, pp. 34-37.

For article on related subject see No. 87.

718. ON LAND DISPOSAL OF LIQUID ORGANIC WASTES THROUGH CONTINUOUS SUBSURFACE INJECTION

by

J. L. Smith et al.

This study was conducted over land spreading used in dispersing organic wastes. This has a positive affect on the soil. Concerns governing this procedure are in five different areas and whether its potential for odor and insects to aesthetics and runoff pollution. Subsurface injection covers these three concerns usually, but the real concern lies in soil pollution and the economical situation. Therefore, knowing changes needed to come about a subsurface injection machine was purchased within economical boundaries. A daily check was administered over the quanity and quality of the water installed in the ground. Soil samples and the ground water was monitored on a continual basis to find different information beneficial to the research.

REFERENCE: Proceedings 3rd Int. Symposium on Livestock Wastes, 1975, pp. 606-610.

For articles on related subject see Nos. 88, 178, 179, and 369.

719. PCB AND PCT CONTAMINATION OF THE ENVIRONMENT NEAR SITES OF MANUFACTURE AND USE

by

Charles L. Stratton and Jackson B. Sosebee, Jr.

This report discussed the presence of polychlorinated biphenyls (PCBs) and polychlorinated terphenyls in the environment from industrial waste emission. PCB and PCT contamination was found in different areas and different concentrations, but was still traced back to the industrial sites. Waste found was believed to have travelled through the air because of its distribution. Treatment facilities showed pollutant reduction to some degree, while contamination has still been found in water, soil, and sewer samples.

REFERENCE: Environmental Science and Technology, Vol. 10, No. 13, December 1976, pp. 1229-1233.

For articles on related subject see Nos. 106 and 498.

720. PCBs AND ENVIRONMENTAL CONTAMINATION

by

W. Klein and I. Weisgerber

This is a survey of polychlorinated biphenyl residues and accumulation in the environment and metabolic pathways of PCBs involving animals and plants. Model studies with technical PCB as well as with pure individual components are presented. Metabolic studies and photochemical experiments are discussed.

REFERENCE: Environment Quality Safety, Vol. 4, 1976, pp. 237-250.

721. PETROLEUM WASTES IN THE SOIL

by

John O. Harris

It is difficult to predict amounts of petroleum wastes applied to the soil since most of it occurs through accidents. These wastes vary from gases to fluids of various densities to tar-like solids.

Some sources of petroleum wastes are oil field production, gaseous and liquid hydrocarbons and asphalt. Means of natural deterioration of these wastes are physical, chemical and biological. Moisture, oxygen, temperature and minerals influence the growth of microbes in biological deterioration. The handling of oilspills often determines the extent to which petroleum wastes affect the soil. The acceleration of microbial decomposition is discussed as a procedure for the clean-up of oilspills. Three tables of data are included in this article.

REFERENCE: Land Application of Waste Materials, Soil Conservation Society of America, 1976, pp. 249-253.

722. POTENTIAL TOXICITY TO PLANTS AND FOOD-CHAIN RESULTING FROM LAND TREATMENT OF HAZARDOUS WASTES

by

Rufus L. Chaney, Ph.D.

This report discusses the possible toxic effects of disposing hazardous wastes by land treatment methods. This phytotoxicity can be caused by waste constituents like soluble salts, toxic organic matter and various heavy metals which become concentrated in the soil. Only a few elements which may reach toxic levels have been found to be absorbed into the edible parts of plants. With this in mind, using proper management procedures can result in an equal, if no improved crop yield from a land treatment site.

REFERENCE: Hazardous Waste Control Research Institute, Silver Spring, MD, Proceedings from Conference on Risk and Decision Analysis for Hazardous Wast Disposal.

723. THE RELATIVE TOXICITY OF FOUR PESTICIDES IN TAP WATER AND WATER FROM FLOODED RICE PADDIES

by

K. W. Brown et al.

Each year in the United States flooded rice fields are sprayed with pesticides. Four of the pesticides tested for static bioassay were propanil, molinate, carbonfuran and carbaryl. The toxicity was present in tap water and floodwater and caused death of fish when the water found draining channels and reached the fish. The toxic limitation median of 96 hours was tested in tap water with perspective of the four pesticides. The results of field applied pesticides were lower in the water from fields in which the residual levels of pesticides had been applied. In addition, pesticides located in the field water were more toxic than that found in the tap water. There were differences present in carbonfuran determined by static flow and an intermittent flow. The difference existed in tap water, but not in field water. In conclusion, all but molinate were similar or greater than the 96 hour value concentration.

REFERENCE: Western Journal of Environmental Studies, Vol. 14, 1979, pp. 49-54.

For articles on related subject see Nos. 111, 392, and 630.

724. SOLVING INDUSTRIAL WASTE WATER PROBLEMS WITH LAND APPLICATION

by

Jimmy W. Otta and C. David Costa

Obtaining desired levels of wastewater treatment is directly related to the care and planning involved in the design and management of the site. Both must be correctly handled to maintain good treatment and prevent irreversible environmental damage. This report contains four case studies from a paper company, brewery, raisin packing firm, and a tomato processing company. They are included to show the effectiveness of proper design and management of wastewater treatment sites.

REFERENCE: 1980 Summer Meeting of the A.S.A.E., Vol. 80-6010, June 1980, pp. 1-19.

For articles on related subject see Nos. 120 and 190.

725. SPENT MOTOR OIL EFFECTS ON SOIL AND CROPS

by

Joel Giddens

The main purpose of this paper is to determine some of the effects of spent motor oil upon soil properties, plant growth, and the nitrogen requirement for plant growth in soil treated with oil. Peanuts, cotton, soybeans, and corn were successfully grown when amply fertilized, mainly with nitrogen, and the oil rates were up to 31,111 liters/ha per pot. The higher oil rates helped reduce the growth of sorghum and weeds. Of the corn grown on newly oil-treated soil, it held less nitrogen and manganese, but the same phosphorus, potassium, calcium, magnesium, and lead as plant grown on untreated soil. The zinc and manganese content of corn tissue was increased because of previous oil applications. Also the growth of corn was increased by increasing the nitrogen application rates.

REFERENCE: Journal of Environmental Quality, Vol. 5, No. 2, 1976, pp. 179-181.

726. INTERACTIVE EFFECTS OF PESTICIDE PROPERTIES AND SELECTED CONSERVATION PRACTICES ON RUNOFF LOSSES: A SIMULATION STUDY

by

J. D. Dean and L. A. Mulkey

This report demonstrates the usefulness of models for studying pesticidal interaction in the environment, specifically on runoff losses. Management practices including conservation, application amounts and application time which affect losses were discussed. A simulation study on pesticides was then completed. The study showed how half-life and conservation practices affected runoff losses. Results are conclusive that all factors including climate, pesticide, properties, and soils should be considered if selecting some type of management practice. This is in light of the fact that most variables studied had some impact on runoff losses.

REFERENCE: Modeling Studies, EPA Athens, Georgia, pp. 715-733.

For articles on related subject see Nos. 8, 124, 134, 201, and 421.

727. NONLINEAR DIFFERENTIAL EQUATION OF DRAIN SPACING

by

William T. Moody

This report discussed the derivation of an equation used for calculating agricultural drain spacing, time, configuration, and soil properties. An approximate formula is presented by which Hooghoudt's equivalent depth may be determined to correct for losses due to convergence of flow to the drains.

REFERENCE: Journal of Irrigation and Drainage Division, Proceedings of
American Society Civil Engineers, Vol. 92, June 1966, pp. 1-9.

728. SIMPLIFIED METHOD OF PREDICTING FALL OF WATER TABLE IN DRAINED LAND

by

Herman Bouwer and Jan van Schilfgaarde

Using the steady-state theory and abrupt drainage of pore space, this method is a good, simple, accurate formula for simple drainage design. However, it is not as accurate as some other formulas. This procedure is for predicting rate fall of the water table in ditch-drained and/or tile-drained land.

REFERENCE: Transactions of the ASAE, 1963, pp. 288-291 and 296.

729. TRANSPORT OF POTENTIAL POLLUTANTS IN RUNOFF WATER FROM LAND AREAS RECEIVING ANIMAL WASTES: A REVIEW

by

R. Khaleel et al.

Animal wastes deposited on land react as being the most degrading to the water during a water runoff. The extent of this study was performed on three samples of land. One being in a feedlot, another being on pasture or range land, and the third being from cropland and such. The climate, how the wastes were deposited, and management of the land were taken into consideration during the time of testing. The passage of nitrogen and phosphorus, oxygen compounds, were tested for the affect the wastes had on them during a water runoff. The affect on nitrogen and phosphorus did differ in time of application depending on whether it was winter and spring or in the summer and fall. Various things of importance like the method used in application of the wastes made a difference in the transporting of these nutrients. Little data has been received over this matter, but further research will be done.

REFERENCE: Water Research, Vol. 14, 1980, pp. 421-436.

730. ASSESSMENT OF INDUSTRIAL HAZARDOUS WASTE PRACTICE-SPECIAL MACHINERY MANUFACTURING INDUSTRIES

by

James Levin et al.

Describes the hazardous waste generated and its management in special industry classes SIC 355, special machinery, and SIC 357, computing and accounting machinery. Plant distribution, size, age, processes, and products are described. Analyzed types and totals of potentially hazardous generated wastes are given and estimated for 1977, 1983. Methods are now used and better alternative methods are discussed.

REFERENCE: EPA- 530/SW-141C, PB 265-981, 1977, pp. 1-230.

731. THE CYTOLOGICAL EFFECTS OF SPACE FLIGHT FACTORS, VIBRATION, CLINOSTAT AND RADIATION ON ROOT TIP CELLS OF TRADESCANTIA

by

K. M. Marimuthu et al.

Four packages of Tradescantia were constructed. Two of these packages were earth bound controls subject to: 1. nothing and 2. gamma irradiation by strontium 85. The other two packages were flown in space and one was subject to gamma irridiation in the same manner as the control. The flown packages were recovered after 2 days and calculations made--flight and nonflight controls showed no difference in chromosome structure; irradiated flight package showed higher abnormality than the irradiated nonflight control. This nuclei adnormality was attributed to a synergistic relationship between the weightlessness and radiation.

REFERENCE: Radiation Research, Vol. 42, 1970, pp. 105-119.

For articles on related subject see Nos. 13, 47, 50, 151, 226, 241, and 712.

732. DAMAGE INCIDENTS FROM IMPROPER LAND DISPOSAL

by

Emery C. Lazar

The problem of the disposal of hazardous wastes has become a significant matter of concern due to the growing implementation air and water contamination control project, ocean dumping bans, and cancellation of pesticide registration. The end result of these activities has been an increase in tonnage of land-disposal wastes, with adverse results on public health and the land. The problem shows its greatest activity in ground water contamination via leachate, surface water contamination due to runoff, air pollution from open burning, sublimation, evaporation and wind erosion, poisoning through the food chain and by direct contact, and fires and explosions at land disposal sites. Various case studies demonstrate these problems.

REFERENCE: Journal of Hazardous Materials, Vol. 1, 1975/1976, pp. 157-164.

733. DETECTION OF CHEMICALLY INDUCED SOMATIC MUTATION IN CHINESE HAMSTERS

by

B. J. Dean and K. R. Senner

A process was tested which detects somatic mutations in organs of laboratory animals which have been exposed to carcinogenic and mutagenic chemicals. Lung cultures of hampsters were studied after an intraperitoneal dose of a direct acting mutagen and a weak carcinogen were administered. In each of these cases, cell density was found to be higher in control cultures than in those with the higher doses. This experiment demonstrated that it is possible to use conventional cell mutation methods for the induction of somatic mutation in tissues of intact animals. This method should detect chemicals which are metabolized in the lungs or in other organs such as the liver or stomach. This study also hoped to explain some of the problems with detecting chemical carcinogens by means of in vitro mutation tests.

REFERENCE: Mutation Research, Vol. 46, 1977, pp. 403-407.

For article on related subject see No. 203.

734. DEVELOPMENT DOCUMENT FOR EFFLUENT LIMITATIONS GUIDELINES AND NEW SOURCE PERFORMANCE STANDARDS FOR THE BASIC FERTILIZER CHEMICALS SEGMENT OF THE FERTILIZER MANUFACTURING

by

Effluent Guidelines Division

This document presents the findings of an extensive study of the fertilizer industry for the purpose of developing effluent limitations guidelines for existing point sources and standards of performance and pretreatment standards for new sources to implement sections 304, 306, and 307 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1551, 1314, and 1316, 86 Stat. 816 et. seg.) (the "Act").

The study included a detailed and extensive exemplary plant survey, contacts with consultants and government officials, and literature search.

The industry survey involved data gathering, sample collection and analysis, and personal visitation with responsible plant operating personnel to obtain first-hand information on treatment technology in commercial use and technology in development and pilot plant stages.

The three main outputs from the study were: industry categorization, recommendations on effluent guidelines, and definition of treatment technology. The fertilizer industry was divided into five categories for more meaningful separation and division of waste water treatment and development of effluent guidelines. These subcategories are phosphate, ammonia, urea, ammonium nitrate and nitric acid products. The phosphate subcategory includes all ancillary operations necessary for phosphate production (e.g. sulfuric acid and phosphoric acid). Effluent guidelines for best practicable control technology currently available, best available technology economically achievable, and new source performance standards are recommended for each category.

Treatment technologies such as either in-process or end-of-process add on units are available or are in advanced development stages to enable existent and future fertilizer plants to meet the recommended effluent guidelines.

REFERENCE: EPA, 440/1-74-011-a, March 1974.

735. DISPOSAL OF INSULATION BOARD MILL EFFLUENT BY LAND IRRIGATION

by

A. H. Philipp

This report discusses the use of spray irrigation of insulation board mill effluent as a method of disposal. To date, the plant has been thoroughly satisfied with the economics, efficiency and fertilization advantages of this system. One concern was the use of spray irrigation at a high latitude location. Low temperatures, especially during the winter months, do inhibit the use of a spray-type system. This problem was alleviated in this case by the construction of a series of storage lagoons. The only problems arising here are initial cost of the lagoons and an odor which is produced by anaerobic bacterial action which may be controlled by sodium nitrate addition.

REFERENCE: Journal of Water Pollution Control Fed., Vol. 43, 1971, pp. 1749-1754.

736. DISPOSAL OF WASTE OIL BY LAND SPREADING

by

B. R. Maunder and J. S. Waid

This report discusses using land spreading techniques for the disposal of waste oil and fats. Procedures for this process are mentioned along with an explanation of hydrocarbon oxidation by soil microorganisms. Finally, a brief introduction to several related studies on oil decomposition rates, economics, and characteristics of treated soil is given.

REFERENCE: Proceedings of the Pollution Research Conference, June 20-21, 1973, pp. 163-176.

For articles on related subject see Nos. 61, 574, and 713.

737. ENVIRONMENTAL IMPLICATIONS OF MULTIJURISDICTIONAL PROBLEMS IN WASTE MANAGEMENT

by

E. Sanderson et al.

Unsatisfactory waste management practices exist, but can not be conveniently blamed on the absence of suitable disposal technology. Yet, even though there are cases with complete lack of regulations, the problems stem from overlapping jurisdictions, including incompatible or conflicting requirements. With these levels of government and other agencies in Canada, this tends to pose a problem. Even in one level of government many of the departments and agencies have overlapping interests when concerned about the disposal of wastes. New international agreements like Ocean Pumping Convention increase the demands on land for waste management. Although waste management has not been a major factor in past land planning, there will be no hesitation to form management now. Various countries have recognized the need for waste management planning. A more comprehensive approach can be adopted by balancing the conflict on healthy economy with acceptable environment.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 317-326.

For articles on related subject see Nos. 299, 577, and 578.

738. FACTORS IMPORTANT IN THE CALCUATION OF HYDRAULIC CONDUCTIVITY

by

R. J. Kunze et al.

This report discussed the modification of a formula used to calculate hydraulic conductivity in soils. The primary modification consisted of extending moisture characteristics and a reduction of the number of pressure classes. Derived saturated conductivity figures were compared to experimentally gathered data by the use of a matching factor. A number of factors such as air entrapment and electrokinetics are not included in the formula. The use of the matching factor, however, can still produce rapid estimates of hydraulic conductivity.

REFERENCE: Soil Science Society American Proceedings, Vol. 32, 1968, pp. 760-765.

739. THE FLUCTUATION TEST AS A MORE SENSITIVE SYSTEM FOR DETERMINING INDUCED MUTATION IN L5178Y MOUSE LYMPHOMA CELLS

by

J. Cole et al.

To analyse spontaneous mutation and the rates involved, a series of Luria-Delbruck Fluctuation tests were run. These tests were done in order to compare Ouabain negativity and mouse lymphoma cells of a mouse. In doing the fluctuation testing, it was found more sensitive and easier to compare mutagens than most other tests.

REFERENCE: Mutation Research, Vol. 41, 1976, pp. 377-386.

For articles on related subject see Nos. 481 and 483.

740. HYDROGEN PEROXIDE MAKES AN EXCELLENT SLUDGE DEODORANT

by

Peter J. Pountney and James Turner

This report discussed the use of hydrogen peroxide as a chemical treatmetn method for hydrogen sulfide odor. Previously used methods including ventilation and chlorination were found to be inadequate methods of treating this odor. Hydrogen peroxide was found to react chemically with hydrogen sulfide to break it down into sulphur and water. This method was concluded to effectively eliminate the unwanted odor. In one project discussed, hydrogen peroxide was to be used in conjunction with a type of aeration system to reduce both the odor and the sulfides produced in the plant.

REFERENCE: Water and Wastes Engineering, September 1979, pp. 56-59.

For articles on related subject see Nos. 307, 312, and 321.

741. HYDROGEN PEROXIDE TREATS DIVERSE WASTEWATERS

by

William C. Strunk

This study examines how diverse wastewaters are treated with hydrogen peroxide. Hydrogen peroxide has been used to treat sludge bulking, to destroy phenol as a source of supplemental oxygen, and to oxide a number of reduced sulfur compounds. When sulfide odors or other sulfide compounds like mercaptons, thiosulfate, and sulfur dioxide are used it deserves evaluation. Hydrogen peroxide can also destroy phenol and free available chlorine. Hydrogen peroxide can be a source of supplemental oxygen, a control agent for filamentous sludge bulking or a preventative for rising sludge resulting from denitrification. With the proper application of hydrogen peroxide, it can often effect on improvement or complete elimination of the problem.

REFERENCE: Industrial Wastes, January/February 1979, pp. 32-35.

742. "INSTANT" WASTES TREATMENT

by

D. J. Molloy

A lagooning and spray irrigation system was developed to solve the Nestle's instant coffee-tea wastes problems at their processing plant in Sunbury, Ohio. After much study on the problem, an unusual approach was adopted. It provided for satisfactory handling of wash water, blowdown water, and waste liquid product resulting from the brewing of coffee and tea. The new method pumped the effluent from a sump to a 750,000 gallon lagoon where it settles for a certain time period. After this period the wastes are pumped to a 10-acre tract owned by Nestle. It is distributed to the land by a spraying device system. Studies were done on the affect the system had on plant life subjected to the effluent spray. Coffee and tea wastes discolor and, in some instances, kill bushes and shrubbery, but grasses and other ground cover seem to thrive on it. Trees are also unaffected. The Nestea plant indicates that the following factors must be evaluated in a lagoon-spray disposal system: 1. Percolation tests on ground must be made. 2. The use of aluminum pipe decreased maintenance problems especially at joints. 3. Motorized values and timing devices do not serve the specific purpose. 4. The spray should be confined to the owner's property. Detention reservoir must be enough to handle the effluent over the winter months.

REFERENCE: Water Works and Wastes, Vol. 1, pp. 68-70.

For articles on related subject see Nos. 281 and 283.

743. INTEGRATING ECOLOGICAL CONCERNS INTO WASTE MANAGEMENT PLANNING

by

B. P. Warkentin and R. N. Yong

This report deals with problems involved when using interconnected, cyclic ecological parameters in linear engineering action. The ridgeness of ecological use argues that the natural system should not be changed. Reasons given are unpredicted side effects that frequently occur, and change is not wanted. The engineering method is based on factors such as cost/benefit analysis for the client. This leads to the presumption of disadvantages of factors being external to the analysis. During planning stages, ecological concerns can be brought into the waste management technology. Things to consider are the "carry capacity" of the environment and of people, the policy of land use in relations to the cost of land and water management, other possibilities, and values in relation to external factors contributing to the economic level. External factors can be changed by altering the basis of cost per benefit calculation. This would put some demand on changing attitudes in respect to waste management.

REFERENCE: Proceedings of the International Conference on Land for Waste Management, October 1973, pp. 327-331.

744. INVESTIGATIONS OF THE CAUSES AND REMEDIES OF THE UNPRODUCTIVENESS OF CERTAIN SOILS FOLLOWING THE REMOVAL OF MATURE TREES

by

L. T. Kardos et al.

This study was concerned with controlling the arsenic toxicity of soils after the removal of mature trees. In most instances, the application of ferrous sulfate decreased the soluble arsenic level to relatively low amounts. Where this treatment failed to significantly increase plant yields, phosphorus fertilization provided the adequate growth stimulation. Arsenic was found to be considerably more toxic when existing in the arsenite rather than the arsenate form.

REFERENCE: Wash. Agric. Exp. Sta. Bull., Vol. 410, 1941, p. 25

745. IRRIGATION AND LAND DISPOSAL OF PULP MILL EFFLUENTS

by

Russell O. Blosser and Eben L. Owens

Laboratory soil column tests were used to study the reduction of biological oxygen demand, removal of color, effects of sodium adsorption ratio as related to soil dispersion, and effluent pH in pulp mill waste effluent. A sand loam, silt load, and two clay loams were the soils used. Overall results concluded that for optimum treatment and soil/vegetation quality, these guides should be considered: application of less than 200 lb per acre per day on these soil types for BOD reduction of 95%+, site investigation for color removal, effluent pH of 6.5-9.0, and an effluent sodium adsorption ratio of 8 or less; however, clay soils require a very low SAR to keep soil deflocculation from occurring.

REFERENCE: Water & Sewage Works, September 1964, pp. 424-432.

746. A LAGOON-GRASS TERRACE SYSTEM TO TREAT SWINE WASTE

by

D. M. Sievers et al.

This study was conducted at a finishing house for 200 head of swine. The study began in March 1972, and continual data was gathered. Different procedures for diluting sludge and dispersing the wastes were done. Water was added to the sludge after finding some two feet of build up of the lagoon botton. Flume stations were set up in which the flow of sludge passed. Tests were taken from the flumes to a laboratory in Kansas City, Missouri. The water samples were refrigerated and then analyzed. Two years later in August 1974, stainless steel samplers were taken to the site to select soil for testing. A check was being made to locate any chemical build-up. Some of the samples identified sodium phosphorus, copper, zinc and arsenic in the extracts. Nitrate was what determined them in the extracts using $1NK_2SO_4$. Further testing was done on the quality of the water in the reservoir and analyses were taken from the terrace soil

REFERENCE: Managing Livestock Wastes, 1975, pp. 541-548.

For article on related subject see No. 698.

747. THE LAND AND HAZARDOUS WASTE MANAGEMENT

by

Joseph S. Pizzuto and Charles W. Townley

This report discussed several aspects of the land disposal of hazardous waste. The report first defined hazardous waste and mentioned several dangers of its improper disposal. The use of landfills and their requirements for proper construction was then discussed. Finally, a number of possible alternatives to landfill disposal were defined. These alternatives included rapid-response techniques, incineration and chemical decontaminants. Other proposals included "waste-to-energy plants", temporary holding facilities and deep-well injection.

REFERENCE: Journal of Soil and Water Conservation, March-April 1981, pp. 79-81.

For article on related subject see No. 607.

748. LAND APPLICATION OF WASTE MATERIALS: UNRESOLVED PROBLEMS AND FUTURE OUTLOOK

by

W. P. Martin et al.

Land is currently considered the disposal site for treated and untreated wastes. Land application of wastes can only be considered in cases where it lends itself to good crop, silvicultural and land management practices. Though a great deal is known about land application of waste materials, many questions go unanswered. Utilization of waste materials as opposed to disposal has been gaining approval. There are, however, drawbacks to utilization through land application. Specific sources of concern are heavy metals, pathogens, nutrient elements such as nitrogen and phosphorus, persistent organics in herbicides, pesticides and polychlorinated biphenyls, organic loadings, waste water and heat, radioactive wastes, salinity, and the possible sacrifice of aesthetic values. A recent suggestion regarding the above hazards is a soil quality index and an establishment of guidelines to follow the index.

REFERENCE: Land Application of Waste Materials Soil Conservation Society of America, 1976, pp. 300-307.

For article on related subject see No. 80.

749. LAND DISPOSAL OF OILY WASTEWATER BY MEANS OF SPRAY IRRIGATION

by

D. M. Neal et al.

This report examined the effectiveness of land treatment as a form of oily wastewater disposal. Various application rates affected the soil somewhat, but no harmful effects were found due to the changes. Some of these minor disturbances were altered organic carbon content, bacterial population and soil pH. Decreasing bacterial population in columns receiving high applications may indicate a toxic condition developing. Decreasing pH was accounted for due to biological activity and the production of organic acids and alcohols. Financially, the project was a success in that enough by-products have been salvaged to cover the total project cost.

REFERENCE: Proceedings of the 1976 Cornell Agricultural Waste Management Conference, 1976, p. 757.

For article on related subject see No. 84.

750. LAND DISPOSAL OF WASTES

by

Raymond C. Loehr

Industrial waste waters can be treated by land treatment means; however, care is essential to integrate the proposed waste water, potential site selection, and vegetation in a way that will not produce adverse environmental conditions. The most frequent problems of this nature are leaky distribution systems, blocked outlets, swamping effect, unharvested vegetation, direct runoff to water ways, and anaerobic conditions in the soil.

REFERENCE: Wateruse--Proceedings of the 2nd National Conference, 1975, pp. 683-687.

For article on related subject see No. 608.

751. MANAGEMENT OF LAND DISPOSAL SYSTEMS FOR ADEQUATE RENOVATION

by

Earl A. Myers

This paper reviewed a Penn State study into the proper management of land treatment disposal systems. The system used is described in detail, and results are given from treatment of food processing, cooling water, sanitary landfill leachate, paper mill, cigar factory, septic tank sludge, and animal waste. Proper management of such treatment should include adequate size and flexibility of the system as well as having the system managed by experienced personnel. The report also mentions the management of overland flow disposal systems.

REFERENCE: Wateruse--Proceedings of the 2nd National Conference, 1975, pp. 664-670.

For articles on related subject see Nos. 34, 88, and 717.

752. OPTIMIZATION OF LAND CULTIVATION PARAMETERS

by

K. W. Brown et al.

Studies on the effect of amending soils with API oil-water separator sludge were conducted. The purpose was to find what effect the sludge had on germination and yield of rye grass. This provided information for the acceptable sludge loading rates and to eliminate mechanisms which affected plant response. Four soils were mixed by proportion with petrochemicals and refinery wastes. Following was the application of the mix onto rye grass and yields and emergence were analyzed. Periodically the soil wettability was determined. Over a 17 month testing period, eight plant harvest cycles were completed. Petroleum hydrocarbons with a concentration as low as 2% v/v decreased the rye grass yield and seemingly through two methods. But long term impairment stemmed from water, air, and nutrient impairments related to recalcitrant hydrophobic hydrocarbons. Sludge did suppress emergence and dry matter yield over long periods of time and was according to the proporation of waste applied.

REFERENCE: EPA Disposal of Hazardous Wastes 6th Research Symposium, March 17-20, 1980, pp. 254-259.

For articles on related subject see Nos. 88, 178, 179, 182, 348, 350, 369, 718, and 727.

753. THE OXIDATION PRODUCTS FORMED FROM SOIL ORGANIC MATTER BY HYDROGEN PEROXIDE TREATMENT

by

Yasuo Harada and Akio Inoko

The experiment was concerned with the effect of hydrogen peroxide on the production of oxidation products from organic matter. Testing utilized several different analytical procedures. After a simulated hydrogen peroxide digestion procedure, most carbon present in the original soil had been removed, while a large percentage of nitrogen still remained. The majority of the nitrogen still present was in the form of ammonia. Ultraviolet light-absorbing substances were also found in the oxidation products as oxalic acid. It was concluded, by one of the methods used, that the vast majority of oxidation products formed because the hydrogen peroxide treatment was in the form of oxalates.

REFERENCE: Soil Science Plant Nutr., Vol. 23, 1977, pp. 513-521.

754. PARTIAL STERILIZATION OF SOIL BY VOLATILE AND NON-VOLATILE ANTISEPTICS

by

Walter Buddin

True partial sterilization has been compared with common antiseptic due to the initial decrease in bacteria numbers and killing of protozoa and nitrifying organisms. Larger protozoa were killed abundantly in the cultures submitted by the soil sterilization. The rate of ammonia, production of ammonia, and productiveness was increased. Sterilization was obtained only through volatile antiseptics. For a beneficial detection of sterilization, the tests should be combined. Flora can be influenced by substances in the soil and simple flora can have high levels of numbers as a general rule. The intensity of effect from the shades could be detected between the action of substances used. Increasing the productive capacity of soil can be done by volatile antiseptics. Those results were from laboratories and pot culture houses. More information is hopefully going to be obtained through analysis and more research. The objection of the testing is to find a species of bacteria which can be subjected to potential poisons and remain productive and produce pure cultures.

REFERENCE: Journal of Agricultural Science, Vol. 16, 1914, pp. 417-451.

755. PETROLEUM REFINERY SOLID AND SEMISOLID WASTE DISPOSAL PRACTICES

by

Ronald J. Lofy and Curtis J. Schmidt

This report discussed the various disposal methods presently in use for the disposal of solid and semisolid petroleum refinery wastes. Methods such as landfilling, land farming, lagoons, pits, incineration, and chemical fixation are discussed. Methods and efficiency of each process are included. The report also gives the percentage of each method in use as well as predicted waste treatment trends.

REFERENCE: Wateruse--Proceedings of the 2nd National Conference, 1975, pp. 1172-1175.

756. POINT MUTATIONS INDUCED BY PHARMACEUTICAL DRUGS

by

A. Carere

A test was undertaken to determine the mutagenic effects of pharmaceutical drugs. The technique used was a "plate test" in which the suspected substance is added to a sample of the chosen bacteria. Results showed six of about one hundred of the drugs tested to be mutagenic. In subsequent tests, however, results varied.

REFERENCE: Mutation Research, Vol. 29, 1975, p. 235.

For articles on related subject see Nos. 106 and 721.

757. PONDING AND SOIL FILTRATION FOR DISPOSAL OF SPENT SULPHITE LIQUOR IN WISCONSIN

by

T. F. Wisniewski et al.

The disposal of spent sulphite liquor, which entails carbohydrate and lignin compound control, was discussed. Lagoons, seepage ponds, and irrigation procedures were the forms of soil filtration under concern. Easily fermented carbohydrates were readily decomposed according to general results. Lignin compounds were not shown to be biologically attacked, but are thought to be strongly absorbed, especially by colloidal type soils. Undetected lignin breakdown, although not proven, may occur. The primary concerns of this type of disposal are not to overload the soil, control flooding, and protect ground water supplies.

REFERENCE: Proceedings of the 10th Industrial Waste Conference, 1955, pp. 480-496.

For article on related subject see No. 187.

758. RECENT DEVELOPMENTS WITH L51178Y TK HETEROZYGOTE MUTAGEN ASSAY SYSTEM

by

Donald Clive

The mammalian cell culture system helps bring together the gulf between microbial systems and whole mammal systems that have been used in mutagenical studies. Lymphoma cells have been known to retain both mammalian architecture and certain parts of mammalian metabolism. An interesting quality of mutagenesis is they emphasize classification as being strong, weak, or of intermediate potency mutagens. Various hycanthone analogs are being studied, one of which has put forth possible negligible mutagenicity at levels inhibiting growth. Tests are in the process of finding new and safe hycanthone substitutes for use in the control of schistosmiasis. Mutagens do not attack in single file but en masse; target cells not being intraperitoneal, but gonadal. Here the issue is not only dead fetuses, but an imperceptibly debilitating numbers, and where Salmonella sapiens do not exist.

REFERENCE: Environmental Health Perspectives, Vol. 6, 1973, pp. 119-125.

For articles on related subject see Nos. 391, 392, 630, and 722.

759. REUSE OF WASTES IN THE PRODUCTION OF GRANULAR FERTILIZERS

by

J. C. Barber et al.

This paper discussed controlling air and water pollution from fertilizer production plants by reusing waste water. The primary factor in accomplishing this was found to be the production of firm, closely sized fertilizer granules, using adequate granulation processes. Caking of the fertilizer may be prevented by formaldehyde applications before granulation. The control of unnecessary spills by careful procedures is also mentioned.

REFERENCE: Wateruse--Proceedings of the 2nd National Conference, 1975, pp. 1181-1189.

760. RIDGE-AND-FURROW IRRIGATION FOR INDUSTRIAL WASTE DISPOSAL

by

F. H. Schraufnagel

This report discusses the use of ridge-and-furrow irrigation for disposing of industrial waste. The ridge-and-furrow method is one of many types of land treatment of waste materials. It consists of flooding furrows between crop rows with liquid waste, which moves laterally through its ridges between furrows where the crop is grown. This, as with most land treatment methods, can provide adequate reduction of substances including phenols, cyanides, iron, manganese, copper, zinc, potassium, and even radioactive wastes in some cases. Although ridge-and-furrow irrigation displays some advantages such as operating costs and the ability to operate during winter months, it has lost much of its use of spray irrigation methods.

REFERENCE: Journal of Water Pollution Control Fed., Vol. 34, 1962, pp. 1117-1132.

761. THE SELECTION AND INDUCTION OF 5-IODO-2-DEOXYURIDINE AND THYMIDINE VARIANTS OF P388 MOUSE LYMPHOMA CELLS WITH AGENTS WHICH ARE USED FOR SELECTION

by

Diana Anderson

5-IODO-2-Deoxyuridine (IUdR), 5-BROMO-2-Deoxyuridine (BUdR), azaguanine, and pyrimidine thymidine (TdR) have been used to select the variant cells of mammals that were previously treated with suspected mutagens. Recent observation and study has revealed that to some extent these selective agents may act as mutagens, thus increasing the frequency of variants or decreasing the frequency of variants due to non-survival of doubly injured cells. This phenomenon could involve the metabolic pathways used by a variety of agents and correspondence between paths used for mutagens or selectors.

REFERENCE: Mutation Research, Vol. 33, 1975, pp. 399-406.

For article on related subject see No. 453.

762. SOLID-WASTE DISPOSAL: LANDFARMING

by

R. L. Huddleston

The spreading of industrial wastes into the upper soil zone goes by many names; however, landfarming is the officially accepted term by the U.S. Environmental Protection Agency and it is the most appropriate term for the process. Advantages presented by landfarming are: 1. cost efficiency, 2. relative environmental safety, 3. recycling waste via natural processes, 4. simplistic processes that are low-maintenance and less likely to go wrong, 5. possible improvement of fertility and soil structure. This article describes how landfarming works and which wastes are suitable for landfarming. Also, detailed in this article are the factors that control biodegradation. Operational steps in landfarming include site selection, site preparation, waste application, soil-waste blending and post waste addition care.

REFERENCE: Chemical Engineering, February 26, 1979, pp. 119-124.

For articles on related subject see No. 40 and 120.

763. SPRAY IRRIGATION FOR INDUSTRIAL WASTES DISPOSAL

by

R. R. Parker

This article is a review of the present spray irrigation techniques for industrial waste effluents used in Canada. Most of the techniques deal with overcoming the climatic problems by Canada's geographical location.

REFERENCE: Canadian Municipal Utilities, 1965, pp. 28-32.

For articles on related subject see Nos. 192 and 725.

764. SPRAY IRRIGATION FOR WASTEWATER DISPOSAL IN SMALL RESIDENTAL SUBDIVISIONS

by

T. C. Williams

Portions of a symposium on the land disposal of waste effluent are presented in this report. It was decided that the discussion should be divided by the catagorization of wastes into industrial wastes and sewage wastes, and separate discussion of application procedures, namely spray irrigation. One topic of concern was the need for secondary treatment of waste before land application.

A table is given showing the various treatment systems considered along with the energy requirements of each. The systems included a trickling filter system, aerated lagoons, anaerobic natural pond system and activated sludge. The energy required per BOD removal was also given.

REFERENCE: National Symposium on Ultimate Disposal of Wastewaters, 1977, pp. 301-311.

For article on related subject see No. 123.

765. SPRAY IRRIGATION OF DAIRY WASTES

by

Gerald W. Lawton et al.

The effectiveness of spray irrigation for disposing of dairy wastes was studied by selecting and building an actual spray irrigation system for a five plant area. The waste produced contained primarily nitrogen, phosphorus and potassium concentrations. These three elements contributed to the fertilization properties of the effluent. A slight problem was encountered with excess sodium arising from salt used in the milk processing plant. Although other values varied widely between plants such as BOD, COD, pH and so on, spray irrigation still appeared to be a promising alternative for disposing of waste of this type.

REFERENCE: Sewage and Industrial Wastes, Vol. 31, No. 8, August 1959, pp. 923-933.

766. SPRAY IRRIGATION OF ORGANIC CHEMICAL WASTES

by

Richard A. Woodley

This report studies irrigation system as a disposal method of organic chemical waste. The program included spray spot selection, application time control, elimination of surface runoff and control of surface ponding. This system was managed so that total treatment of all applied waste occurred. Modifications have also been made for operation in sub-freezing weather. Spray irrigation was concluded as being an effective disposal method for low volume, high BOD waste waters as long as the application rates varied with changing conditions such as waste characteristics and moisture and soil conditions.

REFERENCE: Industrial Waste Conference Proceedings, 1968, pp. 251-261.

767. SPRAY IRRIGATION OF VEGETABLE AND FRUIT PROCESSING WASTES

by

H. G. Luley

This paper discussed the use of spray irrigation for the disposal of wastes coming from the H. J. Heinz Company. The report concentrated on the idea that areas previously thought to be poor sites for spray irrigation usage may be modified to meet requirements. Factors affecting a site suitable for spray irrigation include: 1. land slope, 2. soil surface cover, 3. layers of soil, 4. groundwater table depth, and 5. type and amount of effluent. Data from the two studies done here show the sucessful adaptation of spray irrigation to land at both extremes of the accepted design criteria. One of the problems in this instance was the runoff of liquid into a running stream.

REFERENCE: Journal WPCF, Vol. 35, No. 10, October 1963, pp. 1252-1261.

768. SPRAY IRRIGATION OF WOOD DISTILLATION WASTES

by

R. C. Hickerson and E. K. McMahon

This report discussed the use of spray irrigation as a means of disposing of wood distillation wastes. The process waste was composed of Lime Lee and water column waste with a significantly smaller amount of decanter overflow waste containing high phenolic concentrations giving the waste most of its color. Of a number of different types tested, all but alcohol pot residues and decanter overflow waste were acceptable for spray irrigation purposes. The report includes design of the spray system and cost. Soil analysis of irrigated land showed a need for additional fertilization, primarily phosphate, potassium and nitrogen compounds.

REFERENCE: Journal WPCF, Vol. 32, No. 1, January 1960, pp. 55-64.

For article on related subject see No. 125.

769. A SPRAY IRRIGATION SYSTEM FOR TREATMENT OF CANNERY WASTES

by

L. C. Gilde et al.

An extensive research program was conducted to assess the use of spray irrigation as a means of cannery waste disposal. Measurements were made of effluent quantity, composition, and hydraulics. The program also consisted of testing soil storage capacity, nutrient movement, and biological strata. The procedure showed several advantages including over tertiary treatment concepts, increased crop production, and increased treatment efficiency. The report discusses a wide variety of factors concerning spray irrigation as a treatment and disposal process.

REFERENCE: Journal of Water Pollution Control Fed., Vol. 43, 1971, pp. 2011-2025.

770. STABILIZATION OF SOILS BY PHENOLIC ALCOHOLS

by

Yu. V. Pokonova et al.

This report was concerned with the use of phenolic alcohols for stabilizing soils chemically. α-Chloroethyl ether was the hardener used for this experiment. The hardening of the phenol was examined using electron microscope procedures. Results showed strong, stable structures being formed. The use of α-chloro ethers as an experimental hardener produced higher strength characteristics than previously used hardeners.

REFERENCE: Journal App. Chemistry U.S.S.R., Vol. 46, No. 9, Part 1, September 1973, pp. 2380-2384.

771. STUBBLE MULCH FARMING

by

T. M. McCalla and T. J. Army

"Stubble mulching" is a system of crop residue management sweep tillage instead of soil inversion. The goals of subsurface tillage is to leave desirable quantities of plant residue on the surface for soil erosion control at all times. Managing on this basis requires harvesting, tilling, planting, and cultivation operations that keep vegetative residue material on the soil from seeding to seeding. Generally, small grain residue, wheat monoculture, or limited sorghum residue in a wheat sorghum rotation are used, although any residue may be used. "Stubble mulching" is applicable to any cropping system.

REFERENCE: Advances in Agronomy, Vol. 13, 1961, pp. 125-197.

772. SULFURIC ACID FOR THE TREATMENT OF AMMONIATED IRRIGATION WATER: II. REDUCING CALCIUM PRECIPITATION AND SODIUM HAZARD

by

S. Miyamoto and J. Ryan

Ammoniated water was treated with ammonia and sulfuric acid separately. Theoretical calculations were made to determine calcium precipitation and potential problems from excess sodium. The ammonia treatment did increase exchangeable sodium and in some cases reduced water infiltration rates as well as causing severe calcium precipitation. Sulfuric acid, on the other hand, reduced exchangeable sodium and calcium precipitation as well as preventing a decrease of infiltration rates. In light of the data presented, the use of sulfuric acid in treating ammoniated irrigation water can be beneficial.

REFERENCE: Soil Science Society American Journal, Vol. 40, 1976, pp. 305-309.

For article on related subject see No. 413.

773. TREATMENT OF REFINERY OILY WASTES BY LAND FARMING

by

Robert L. Huddleston and Jeffrey D. Meyers

Those responsible for the disposal of oily refinery wastes have become more and more favorable to landfarming as the best means of disposal of these wastes.

Depending upon the characteristics of the test areas, a 54 to 67% loss in oil weight was found over a period of twenty months. It was indicated by a 19 to 49% total weight of organic compound loss that a significant amount of the oil had been changed into soil microbial mass or partly degraded organic matter. No leaching of oil total organic compound or heavy metals was found. The conditions of growth by the plants was not apparently beneficial by the oil loss rate. The analyses and results are presented in table form at the end of the article.

REFERENCE: American Institute of Chemical Engineers, Vol. 75, No. 190, 1979, pp. 327-339.

For article on related subject see Nos. 4, 419, and 423.

774. ULTIMATE LIQUID WASTE DISPOSAL METHODS

by

J. R. Conner

This paper presents a general discussion of waste disposal methods. Ultimate disposal methods can be either storage, transfer, or treatment processes. Storage methods such as lagooning only retain the waste for a given period of time until another alternative can be found. Transfer procedures such as waste burial and hauling wastes to a central lagoon can be categorized into either retrievable or nonretrievable methods. Treatment methods are usually the most effective and involve mechanical or physical dewatering, thermal treatment, or chemical/biological treatment. The respective uses, effectiveness, and costs of some of these methods are also mentioned.

REFERENCE: Plant Engineering, October 19, 1972, pp. 88-92.

For article on related subject see No. 441.

775. AMMONIA VOLATILIZATION FROM SURFACE-APPLIED WASTEWATER SLUDGE

by

J. A. Ryan and D. R. Keeney

Emphasis is upon the amount of nitrogen present in wastewater slurry. This nitrogen content when applied to soil is greater than the amount useable by the crops. It is known that volatilization can decrease the total nitrogen of this slurry when air dryed, therefore, decreasing the chance of excess nitrogen contaminating groundwater. Rates of nitrogen volatilization, soil factors on volatilization, and application rates are discussed, experimentally tested, and reported on.

REFERENCE: Journal WPCF, Vol. 42, No. 2, 1975, pp. 386-393.

For articles on related subject see Nos. 134 and 138.

776. DETERMINATION OF TRACE HAZARDOUS ORGANIC VAPOR POLLUTANTS IN AMBIENT ATMOSPHERES BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY/COMPUTER

by

E. D. Pellizzari et al.

Organic vapors were collected from surrounding air samples from three different locations. These locations were Houston, Texas; Raleigh, North Carolina; and Los Angeles, California Basin. Gas chromatography cartridges were used in gathering these air samples. The vapors were thermally desorbed and examined with a capillary gas-liquid chromatograph joined with a large spectrometer. Data was recorded on magnetic tape and brought into affect the normal quanity spectra and main part fragmentograms. The overall backing of hydrocarbons from various automobiles were eventually brought about from one another, and twenty-one non-metallic chemicals were found. Some of these halogens were carcinogen vinyl chloride and trichloroethylene. Others were various oxygens, nitrogens, sulfur and silicon compounds.

REFERENCE: Analytical Chemistry, Vol. 48, No. 6, May 1976, pp. 803-807.

777. A NEW METHOD FOR DECOMPOSITION AND COMPREHENSIVE ANALYSIS OF SILICATES BY ATOMIC ABSORPTION SPECTROMETRY

by

Bedrich Bernas

This new method of decomposing igneous rocks is far superior to conventional methods. It utilizes a volatilization loss free teflon decomposition vessel in which material is decomposed by use of a floric-boric acid matrix. Being a single step method, there is no need for interfering added chemical factors. Diagrams, procedures, and results of use are fully explained therein.

REFERENCE: Analytical Chemistry, 1968, pp. 1682-1686.

778. RAPID AND INEXPENSIVE METHOD FOR DETECTION OF POLYCHLORINATED BIPHENYLS AND PHTHALATES IN AIR

by

C. S. Giam et at.

Gas chromatographic packing, a simple, sensitive, and inexpensive solid sampling process which is used to detect phthalate esters, polychloronated byphenyls (PCBs) and DDT was described. Since florisil was found to absorb organic chemicals when exposed to contaminated air, it was used as an air sampling absorbent. Florisil was very efficient in trapping such substances as DEGP, DDT, and PCBs. Other organic compounds could also be absorbed and separated by this method by using various other absorbents or eluant combinations. This procedure was found to be successful and could possibly be used to monitor air in industrial plants and other working areas.

REFERENCE: Analytical Chemistry, Vol. 47, November 1975, pp. 2319-2320.

779. WHAT HAPPENS TO HERBICIDES IN THE ENVIRONMENT?

by

J. B. Weber et al.

Herbicides are no longer a subject of agricutural interest, but are now a concern for today's ecologically oriented society. A sordid picture of herbicides has been painted by the press. This article is intended to provide information concerning herbicides and the environment. It discusses the forces that act on herbicides such as biological decomposition, chemical decomposition, and photodecomposition. Six transfer processes are also discussed. These are absorption and exudation by plants and animals; retention in vegetation and then transference in harvested products; adsorption by soil particles; movement through the air and into the atmosphere; surface runoff of herbicides into bodies of water; and movement through the soil. None of the processes above can be isolated since all are closely interrelated. The transfer processes are usually reversible and in dynamic equilibrium with the system.

REFERENCE: Weeds Today, Winter 1973, pp. 16-17 and 22.

For article on related subject see No. 208.

780. DAMAGE INCIDENTS FROM IMPROPER LAND DISPOSAL

by

Emery C. Lazar

The problem of the disposal of hazardous wastes has become a significant matter of concern due to the growing implementation air and water contamination control projects, ocean dumping bans, and cancellation of pesticide registration. The end result of these activities has been an increase in tonnage of land disposal wastes with adverse results on public health and the land. The problem shows its greatest activity in ground waste contamination via leachate, surface water contamination due to runoff, air pollution from open burning, sublimation, evaporation and wind erosion, poisoning through the food chain and by direct contact, and fires and explosions at land disposal sites. Various case studies demonstrate these problems.

REFERENCE: Journal of Hazardous Materials, Vol. 1, 1975/1976, pp. 157-164.

781. CHEMICAL MONITORING OF SOILS

by

Dale E. Baker and Leon Chesnin

The objectives of this article are to consider aspects of environmental quality in which soils may serve as sources of sinks for toxic substances in air, water, and the food chain; and to look over and interpret methods and concepts essential in soil chemical monitoring. The article deals with these objectives through discussions covering soil pollution sources, soil and water composition monitoring, methods of chemical analysis, monitoring of macroelements, monitoring of microelements, toxic trace elements and organometallic complexes and recommendations for further research. Each discussion covers specific subtopics: 1. soil pollution source-agricultural pollutants and soil erosion, animals wastes, industrial and municipal wastes, 2. soil and waste composition monitoring-total composition results, labile concentrations and ionic activities, and bioassay techniques for chemical monitoring of soils, 3. methods of chemical analysis-prêcision and accuracy and instructional methods, 4. monitoring of macroelements--soluble salts, nitrogen-nitrite, nitrite, ammonia--and nitrodomines, phosphorus, potassium, calcium, magnesium, and sulfur. Monitoring of microelements--boron, iron, manganese, zinc, copper, molybdenum, iodine, selenium, cobalt, fluorine, vanadium, nickel, and lithium; and toxic elements, organometrallic complexes--cadmium, lead, nickel carbonyl, antimony beryllium, mercury, and arsenic.

Numerous tables are included for a better understanding of each discussion.

REFERENCE: Advances in Agronomy, Vol. 27, 1975, pp. 306-374.

782. PARTIAL STERILIZATION OF SOIL BY VOLATILE AND NON-VOLATILE ASTISEPTICS

by

Walter Buddin

True partial sterilization has been compared with common antiseptic due to the initial decrease in bacteria numbers and killing of protozoa and nitrifying organisms. Larger protozoa were killed abundantly in the cultures submitted by the soil sterilization. The rate of ammonia, production of ammonia, and productiveness was increased. Sterilization was obtained only through volatile antiseptics. For a beneficial detection of sterilization, the tests should be combined. Flora can be influenced by substances in the soil and simple flora can have high levels of numbers as a general rule. The intensity of effect from the shades could be detected between the action of substances used. Increasing the productive capacity of soil can be done by volatile antiseptics. Those results were from laboratories and pot culture houses. More information is hopefully going to be obtained through analysis and more research. The objection of the testing is to find a species of bacteria which can be subjected to potential poisons and remain productive and produce pure cultures.

REFERENCE: Journal of Agricultural Science, Vol. 16, 1914, pp. 417-451.

For articles on related subject see Nos. 3, 176, 225, 281, 322, 369, 717, and 753.

783. STUDIES ON ENVIORNMENTAL CONTAMINATION BY URANIUM
3. EFFECTS OF CARBONATE ION ON URANIUM ADSORPTION TO AND DESORPTION FROM SOILD

by

T. Yamamota et al.

Previous testing was done on various soils for the affect uranium had on them excluding the carbonate ion factor. Three soils including alluvial, sandy, and volcanic ash soils were air dryed and exposed to carbonate ions. The uranium adsorbed into the soil was at about 100%. Uranyl mixtures of 1-50 μg Uranium/ml combined with carbonate solution of 4.3-109 μg Carbon-ate$_3$-/ml were the ratio used for adsorption in the soil. Soils absorbed with uranium were washed five times as part of the experiment. The water was distilled and passed through Buchnew Funnel with a paper filter known as Toyo. Desorption experiments were done on three water samples taken from the Yoshii River and two streams known as the Ikego and the Nakatsugo. With uranium soil adsorbing from 7.1-500 μg Uranium/g and carbonate ions ranging from 4.3-43.3 μg/ml, it caused the desorption level to be lowered in the soils adsorbing uranium at the precent of 1.2%.

REFERENCE: Journal of Radiat. Res., Vol. 14, 1973, pp. 219-224.

For articles on related subject see Nos. 419, 514, and 723.

784. A DOUBLE TUBE METHOD FOR MEASURING HYDRAULIC CONDUCTIVITY OF SOIL IN SITU ABOVE A WATER TABLE

by

Herman Bouwer

Methods used to find in situ in saturated soil is not easily perfected in the above-the-water-table. In this instance, a method of measuring hydraulically the conductivity in in situ in soil is presented. Essentially, the process takes place in a saturated section of soil. An auger hole is drilled in which two concentric tubes are placed. Measurements are based on the rate of change and the water level of the inner tube. The flow between the tubes are separated due to continued intake of water in the soil. Because of different water levels, dimensionless parameters were used to measure the water levels. These parameters were designed for three types of soils, a uniform soil and soils underlain with components of lower and higher conductivity. As a variable the depth of material with different conductivity was selected.

REFERENCE: Soil Science Society of America, Vol. 25, 1961, pp. 334-339.

785. EFFECT OF LONG TERM LAND DISPOSAL BY SPRAY IRRIGATION OF FOOD PROCESSING WASTES ON SOME CHEMICAL PROPERTIES OF THE SOIL AND SUBSURFACE WATER

by

D. C. Adrian et al.

Subsurface waters of two varieties, perched and groundwater, were monitored at daily and monthly intervals. These waters were taken from two irrigated land disposal sites of food processing waste waters. Samples of soil profiles were taken up from depth of up to 6.6 meters. Calculated inputs of 487 kg/ha of total nitrogen and 101 kg/ha of soluble orthophosphate were taken from cannery wastes yearly from site one. From site two, 562, kg/ha total nitrogen and 522 kg/ha orthophosphate were selected and analyzed. Nitrate ranged in subsurface waters at 7 to 16 ppm from the first site. Groundwaters from site two ranged from 2 to 41 ppm. Nitrate was analyzed as stable in percolation streams below root zone level. While major irrigation input was carried out, nitrate was found in levels above public health standards in the surface waters. Passing environmental standards was PO_4 on a regular basis except when discontinued during the winter. Residual accumulation rate in soil could have been lowered by harvest removal to help materially extend the life of these systems.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 2, 1975, pp. 242-248.

786. A TECHNIQUE USING POROUS CUPS FOR WATER SAMPLING AT ANY DEPTH IN THE UNSATURATED ZONE

by

Warren W. Wood

This paper describes an improved design of the Parizek-Lane system that allows the collection of water samples at any certain depth, saturated or unsaturated. A check value in the cup assembly prevents pressurization of the porous cup. This type of structure allows an entire collection at any depth without the loss of samples. An improvement over past designs is illustrated by a detailed description of construction and operation.

REFERENCE: Water Resources Research, Vol. 9, No. 2, April 1973, pp. 486-488.

For article on related subject see No. 6.

787. TRANSIENT-FLOW CONCEPT IN SUBSURFACE DRAINAGE: ITS VALIDITY AND USE

by

Lee D. Dumm

By adding the more accurate details of a curved water table surface to the basic transient-flow theory, a substantial increase in the agreement of computed values to measured values of water table height and drain spacing was attained. This report cites comparisons done in Australia, Canada, and Arizona in which the measured values were in close agreement with the previously computed values for those places.

REFERENCE: Transactions of the ASAE, 1964, pp. 142-146 and 151.

For article on related subject see No. 519.

788. MOVEMENT OF PROMETRYNE THROUGH CONGAREE SOIL INTO GROUND WATER

by

K. S. LaFleur et al.

The movement of prometryne, a type of herbicide, through the soil and into a shallow groundwater table was determined. The chemical was monitored in both the soil and the ground water for 16 months. Upper layers of the soil consistantly retained higher concentrations of the substance than the layers below them. Infiltration into the water table was discovered two months after the initial prometryne application. Data concerned with the experiment included rainfall, pore volumes, runoff and drainage. A post-experiment check found no prometryne concentrations in the ground water after a period of 20 months.

REFERENCE: Journal of Environmental Quality, Vol. 4, No. 1, 1975, pp. 132-133.

For articles on related subject see Nos. 41, 479, and 482.

789. NITROGEN REMOVAL IN A SUBSURFACE DISPOSAL SYSTEM

by

A. Andreoli et al.

Groundwater contamination was the result of nitrates in individual septic tank leaching systems located in Suffolk county. The groundwater is the main water supply for inhabitants up to 1,300,000 people. This study was used to eliminate nitrate-nitrogen from the wastewaters. A design was constructed and placed in the soil below leaching in the field. The construction was in the shape of a pan in the form of an impermeable membrane. After injecting methanol as a denitrification in the pan, a year of evaluating was begun. Following the year of tests, the system had functioned well. The nitrate-nitrogen was below public health level. These results show the system can be developed for use of removing nitrates from subsurface wastewater disposal systems.

REFERENCE: Prog. Water Technology, Vol. 12, 1980, pp. 967-976.

For article on related subject see No. 440.

790. BACTERIAL DEGRADATION OF POLYCHLORINATED BIPHENYLS.I. IDENTIFICATION OF SOME METABOLIC PRODUCTS FROM AROCLOR 1242

by

Klaus L. E. Kaiser and Paul T. S. Wong

Aroclor 1242 was introduced to a lake water bacterial cultural to assess the bacterial degradation of the polychlorinated biphenyls (PCB's) present. Positive degradation was shown even at high concentrations. A number of metabolites were identified through the use of combined gas chromatographic/ mass spectrometric analysis. Of these metabolites, no chlorine content was found at all.

REFERENCE: Bull. of Environmental Contamination and Toxicology, Vol. 11, No. 3, 1974, pp. 291-296.

For articles on related subject see Nos. 217, 224, 226, 227, and 522.

791. BIODEGRADATION OF PETROLEUM IN SEAWATER AT LOW TEMPERATURES

by

R. M. Atlas and R. Bartha

Samples of polluting oils were taken from cold ocean water and tested for the intensity of biodegradation present. The samples were treated with petroleum and stored in incubation of temperatures 5 through 20°C. The low temperatures caused lags and slow degradation with biodegradation. Quantitative gas was used along with CO_2 to monitor biodegradation and allow for analysis to take place. The lag periods were changed when a different sample was used rather than fresh petroleum. A form of weathered petroleum was applied, and the results from this procedure proved low temperatures caused a slow down in biodegradation.

REFERENCE: Canadian Journal of Microbial, Vol. 18, August 21, 1972, pp. 1851-1855.

792. DEGRADATION OF 2,4-D AND ATRAZINE AT THREE SOIL DEPTHS IN THE FIELD

by

T. L. Lavy et al.

(2,4-dichlorophenoxy) acetic acid (2,4-D) and 2-chloro-4-(ethylamino)-6-(isopropylamino)-5-tri-azine (atrazine), which are synthetic organic compounds, were added to soils from 15, 40, and 90 cm. The amended soils were then replaced into the original fields at their original depth. At intervals of 5, 17, 29, and 41 months, rates of degradation for both compounds were taken. Aerobic degradation of 2,4-D was rapid at all depths in both soils; however, atrazine degradation decreased over time as depth increased.

REFERENCE: Journal of Environmental Quality, Vol. 2, No. 1, 1973, pp. 132-137.

For articles on related subject see Nos. 50, 232, 234, 238, 244, 246, 250, 260, 263, 264, 265, 267, 470, 471, 472, and 541.

793. ENUMERATION OF PETROLEUM-DEGRADING MICROORGANISMS

by

J. D. Walker and R. R. Colwell

This experiment dealt with counting petroleum degrading microorganisms and determining the medium necessary for the optimum growth of the petroleum-degraders. The ideal medium consisted of certain percentages of oil and phenol red along with fungizone, streptomycin, and tetracycline. Temperature also affected the growth of the microorganisms studied. It was found that a certain yeast medium could be successfully used to isolate petroleum-degrading yeasts and fungi.

REFERENCE: Applied and Environmental Microbiology, Vol. 31, No. 2, February 1976, pp. 198-207.

For articles on related subject see Nos. 276, 278, and 475.

794. INTERACTIONS BETWEEN POLYCHLORINATED BIPHENYLS (PCBs) AND SOIL MICROFUNGI. EFFECTS OF AROCLOR-1254 AND OTHER PCBs ON ASPERGILLUS FLAVUS CULTURES

by

M. A. Murado et al.

Polychlorinated biphenyls as xenobiotic compounds have a large environmental spread. The study was conducted in order to find results concerning PCB and biochemical affects on living things. Results show accumulation, metabolism, toxicological and distribution data needs to be studied further, but these four characteristics are important to PCB. During incubation PCB did not change metabolically, but induced growth in cultures. Aroclor found in the incubation had a high magnitude of 1232 and a low of 1260. This was a result only if the microorganisms were grown in a liquid culture of 25 ppm Aroclor series of 32, 42, 48, 54, and 60 percent chlorine.

REFERENCE: Pollution Environmental Contamination Toxicology, Vol. 15, 1976, pp. 768-775.

For articles on related subject see Nos. 302, 315, 320, 330, and 332.

795. MERCURY-RESISTANT BACTERIA AND PETROLEUM DEGRADATION

by

J. D. Walker and R. R. Colwell

This paper looks at samples collected in Colgate Creek, which is located in Baltimore Harbor of Chesapeake Bay, from the samples of concentration of mercury in water and sediment, and the oil extracted from water and sediment was determined. The samples showed the concentration of mercury in the oil to 4,000 times higher than in sediment, and 300,000 times higher than in water samples. The paper suggests that in a heavy metal-enriched environment, mercury and those heavy metals soluble in oil may concentrate in the oil, and the mercury-resistant microorganisms present in the mercury-rich, oil-laden samples are capable of utilizing oil.

REFERENCE: Applied Microbiology, Vol. 27, No. 1, January 1974, pp. 285-287.

For articles on related subject see Nos. 337 and 717.

796. MICROBIAL DEGRADATION OF MODEL PETROLEUM AT LOW TEMPERATURES

by

J. D. Walker and R. R. Colwell

Model petroleum was used to determine the extent of petroleum degradation by bacteria, yeasts and fungi. Numbers of degrading organisms are associated with the benzene-extractable concentration. Degradation was related to temperature of the environment, especially low temperatures and to the type of number of microorganisms in the original sample.

REFERENCE: Microbial Ecology, Vol. 1, 1974, pp. 63-95.

For articles on related subject see Nos. 348, 350, and 351.

797. ROLE OF EXCRETED CHLORTETRACYCLINE IN MODIFYING THE DECOMPOSITION PROCESS IN FEEDLOT WASTE

by

G. Keith Elmund et al.

A concern about water and air pollution brought about in feedlots started this study. Changes from outside effects can alter the state of the feedlot. Outside weather, temperatures, the nutrients given to the animals are examples of a few conditions. Reports have found antibiotic supplements can increase weight gain, conversion of feed in animal and produce a healthy stable animal. Drugs induced into an animal's system can cause unhealthy conditions for the animals as well as the public. These conditions break down the decomposition that naturally take place in a digestive system. Therefore, the excretions may be less biodegradable. This all results in environmental pollution expectation.

REFERENCE: Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 2, 1971, p. 129.

For articles on related subject see Nos. 35, 94, 352, 353, 355, 356, 357, 377, 389, 390, 391, 498, 654, 719, and 723.

798. A THRENODY CONCERNING THE BIODEGRADATION OF OIL IN NATURAL WATERS

by

G. D. Floodgate

Microbial degradation of oil in the marine environment can be defined by the degradation of a complex and variable mixture of hundreds of substrates by unknown mixed populations of microorganisms in an erratically changing medium. Biodegradation is not the only means by which oil is changed chemically.

The author describes several experiment designs and the problems that come with each. These designs are experiments that approach an ecological problem strictly from a biochemical point of view. A description of various advantages and disadvantages of several experimental methods are given. The methods mentioned are the batch culture method and continuous culture techniques. A lengthy description tells of interpretation of data. These are also approached with an advantage-disadvantage perspective.

The main emphasis in concluding this article is on the need for a broader ecological approach to the problem of oil degradation and for an increase in the study of the problem.

REFERENCE: The Microbial Degradation of Oil Pollutants, 1973, pp. 17-24.

For articles on related subject see Nos. 190, 191, 413, 428, 453, and 770.

799. LANDFARMING SHOWS PROMISE FOR REFINERY WASTE DISPOSAL

by

H. E. Knowlton

Landfarming is a safe and effective method of disposal of many organic petroleum wastes. Oily sludges and biosolids (from less than 200 to more than 600 bbl/year/acre) are spread several inches thick and cultivated at regular intervals to provide oxygen.

A landfarm site should be chosen carefully so that it can be controlled and limited from surrounding environments as much as possible. However, when a landfarm site is monitored and controlled properly (oil content, nutrient content, and pH regulated), this can be a very effective disposal technique.

REFERENCE: Oil and Gas Journal, May 14, 1979, pp. 108-116.

For article on related subject see No. 129.

800. MEASUREMENT OF PHTHALATE ESTERS IN MARINE AIR

by

C. S. Giam et al.

A detailing of the sampling, analysis, and evaluation of polyurethane foam, amberlite XAD-2, and florisil as absorbents to concentrate atmospheric phthalate ester plasticizers in marine atmospheres. As a result of several trials, the high-volume polyurethane-foam/glass-fiber-filter absorbent showed the best characteristics for sampling with a relatively small margin of error.

REFERENCE: Proceedings of the 4th Joint Conference on Sensing of Environmental Pollutants, 1977, pp. 188-190.

For articles on related subject see Nos. 20, 21, 22, 28, 170, 175, 203, 444, and 698.

801. 1977 SCREENING SURVEY FOR MEASUREMENT OF ORGANIC PRIORITY POLLUTANTS IN PETROLEUM REFINERY WASTEWATERS

by

F. M. Pfeffer

This report describes the involvement of the Robert S. Kerr Environmental Research Laboratory in screening petroleum refinery effluents for priority pollutants by the EPA's sampling and analysis procedures of March 1977.

REFERENCE: Symposium Measurement of Organic Pollutation in Water/Wastewater, ASTM STP 868, 1979, pp. 181-190.

802. POLYCYCLIC AROMATIC HYDROCARBONS IN THE ENVIRONMENT: ISOLATION AND CHARACTERIZATION BY CHROMATOGRAPHY, VISIBLE ULTRAVIOLET, AND MASS SPECTROMETRY

by

Walter Giger and Max Blumer

This is a report of a continuous study into the origination and fate of hydrocarbons in nature. Methods for isolation, fractionation, and analysis of polycyclic aromatic hydrocarbons from environmental samples such as soils and near-shore marine sediments are discussed also.

REFERENCE: Analytical Chemistry, Vol. 46, No. 12, 1974, pp. 1663-1671.

For articles on related subject see Nos. 376 and 718.

803. THE RELATIVE TOXICITY OF FOUR PESTICIDES IN TAP WATER AND WATER FROM FLOODED RICE PADDIES

by

K. W. Brown et al.

Each year in the United States flooded rice fields are sprayed with pesticides. Four of the pesticides tested for static bioassy were propanil, molinate, carbonfuran and carbaryl. The toxicity was present in tap water and floodwater and caused death of fish when the water found in draining channels reached the fish. The toxic limitation median of 96 hours was tested in tap water with perspective of the four pesticides. The results of field applied pesticides were lower in the water from fields in which the residual levels of pesticides had been applied. In addition, pesticides located in the field water were more toxic than that found in the tap water. There were differences present in carbofuran determined by static flow and an intermittent flow. The difference existed in tap water, but not in field water. In conclusion, all but molinate were similar or greater than the 96 hour value concentration.

REFERENCE: Western Journal of Environmental Studies, Vol. 14, 1979, pp. 49-54.

For articles on related subject see Nos. 36, 126, 197, 519, 705, 707, and 708.

804. ADSORPTION AND OXIDATION OF BENZIDINE AND ANILINE BY MONTMORILLONITE AND HECTORITE

by

T. Furukawa and G. W. Brindley

A number of calculations were taken from benzidine and aniline adsorption in aqueous hydrochloride solutions. The solutions took in sodium, calcium, and lithium of displaced cations that were inorganic. Adsorption of benzidine increased the pH when under controlled conditions. Species involved were mainly at a pH level of < 3·2. Coloring was used as a beneficial factor in testing when compared to adsorption data. Blue coloring appeared more effective on hectorite when dissolved oxygen on H_2O_2 was used. Yellow was used more under acid conditions.

REFERENCE: Clays and Clay Minerals, Vol. 21, 1973, pp. 279-288.

805. A COMPARISON OF ANALYSIS METHODS FOR HYDROCARBONS IN SURFACE SEDIMENTS

by

J. W. Farrington and B. W. Tripp

This experiment compared three procedures for extracting hydrocarbons from surface sediment samples. The methods, 1. methanol: benzene Soxhlet extraction with hydrochloric acid pretreatment, 2. without hydrochloric acid treatment, and 3. alkaline hydrolysis extraction, all showed similar extraction characteristics. Analysis of portions of the extracted hydrocarbons showed a wide range of hydrocarbons including biogenic types. All three techniques studied appeared to be adequate means of hydrocarbon extraction.

REFERENCE: Marine Chemistry, 1975, pp. 267-284.

For articles on related subject see No. 143, 444, 531, 536, 538, and 775.

806. A COMPARISON OF FOUR METHODS FOR MEASURING RESPIRATION IN ORGANIC MATERIAL

by

Keith Van Cleve et al.

Infrared gas analysis (i.r.g.a.), gas chromatography (g.c.), KOH absorption of carbon dioxide (b.a.), and the Gilson respirometer were the four methods that were compared for the measurement of respiration of birch forest-floor organic matter prepared in an uniform manner. While the moisture level was kept constant, estimates of respiration were made at a constant temperature and at variable temperatures. The i.r.g.a. and b.a. methods were high, the Gilson method was intermediate, and the g.c. method was low in the estimates of respiration. Estimates for the g.c. were low due to the closed system used.

The minimum sensitivity at 25°C of the g.c. and the Gilson were 3.8 and 3.6 μg of carbon dioxide, respectively. The minimum sensitivity of the b.a. method, 44 μg of carbon dioxide, might have been improved by using a microliter burette for titrations. The least minimum sensitivity aquired with the i.r.g.a. was 0.31 μg of carbon dioxide. Certain conditions must be maintained in order to avoid adverse effects when estimating respiration.

REFERENCE: Soil Biol. Biochem., Vol. 11, 1979, pp. 237-246.

807. DETERMINATION OF ALIPHATIC AND AROMATIC HYDROCARBONS IN MARINE ORGANISMS

by

J. S. Warner

Chemical ionization mass spectrometry, a process which can detect very low levels of hydrocarbons in marine organisms, was used to test for aliphatic and aromatic hydrocarbons in large quantities of marine organisms. This process was primarily concerned with determining the aromatic type. Three fractions were found: a saturated fraction, a mono- and diaromatic fraction, and a triaromatic fraction. Olefinic hydrocarbons, which are frequently present in marine samples, were found with the aromatic hydrocarbons in fractions 2 and 3 according to the amount of saturation. These hydrocarbons were found to be good petroleum indicators.

REFERENCE: Analytical Chemistry, Vol. 48, March 1976, pp. 578-582.

For articles on related subject see Nos. 5, 466, and 561.

808. A DOUBLE TUBE METHOD FOR MEASURING HYDRAULIC CONDUCTIVITY OF SOIL IN SITU ABOVE A WATER TABLE

by

Herman Bouwer

Methods used to find in Situ in saturated soil is not easily perfected in the above-the-water-table. In this instance, a method of measuring hydraulically the conductivity of in situ in soil is presented. Essentially, the process takes place in a saturated section of soil. An auger hole is drilled in which two concentric tubes are placed. Measurements are based on the rate of change and the water level of the inner tube. The flow between the tubes are separated due to continued intake of water in the soil. Because of different water levels, dimensionless parameters were used to measure the water levels. These parameters were designed for three types of soils, a uniform soil and soils underlain with components of lower and higher conductivity. As a variable the depth of material with different conductivity was selected.

REFERENCE: Soil Science Society of America, Vol. 25, 1961, pp. 334-339.

For articles on related subject see Nos. 24 and 474.

809. INCORPORATION OF LIQUID HYDROCARBONS INTO AGAR MEDIA

by

J. N. Baruah et al.

Emulsifiers can be used to disperse liquid hydrocarbons in an agar media. However, they are unstable in autoclaving, and by developing substrates or influencing the microorganism, they cause inaccurate test results. Now hydrocarbons can be incorporated into agar media by first adsorbing hydrocarbons into silica gel, and then mixing the silica with the agar media, which produces a homogeneous, translucent agar in which colony formations can easily be seen.

REFERENCE: Applied Microbiology, Vol. 15, No. 4, 1967, p. 961.

For articles on related subject see Nos. 6, 31, 77, 165, 168, and 313.

810. INVESTIGATION OF AROMATIC HYDROCARBONS BY REVERSED PHASE HPLC

by

L. Szepesy and M. Czencz

This article investigates the use of high-pressure, high performance liquid chromatography. This method gives a better separation and can even be used to prefraction complex samples for further analysis. It also has new possibilities for specific selectivity of aromatic compounds because of the use of reverse phase packings.

REFERENCE: Periodica Polytechnia, Vol. 24, No. 2-3, 1980, pp. 123-137.

For article on related subject see No. 794.

811. METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES 1978

by

John F. Koop, Gerald McKee

This is the third edition of analyzation procedures used by EPA laboratories for examining ground or surface water, domestic and industrial waste effluents. It provides tests procedures for physical, inorganic, and selected organic particulates.

REFERENCE: EPA-600/4-79/020, PB-297-686, 1979, pp. 1-463.

For articles on related subject see Nos. 886, 343, 688, and 800.

812. A MODEL FOR THE TRANSPORT OF PESTICIDES IN SOIL WITH DIFFUSION-CONTROLLED RATES OF ADSORPTION AND DESORPTION

by

M. Leistra

A simulated model of the downward movement of a pesticide in soil was utilized to study diffusion-controlled rates of adsorption and desorption. Lateral transportation occurred by diffusion through a soil region with a stagnant liquid phase. Pesticide concentration was significantly affected by rapid lateral diffusion, while shorter diffusion distances had a weaker influence. Mobility was closely related to the initial soil condition being highest when beginning in a mobile region.

REFERENCE: Agriculture and Environment, Vol. 3, 1977, pp. 325-335.

For article on related subject see No. 447.

813. POT CULTURE EXPERIENCE

by

J. A. Voelcker

This paper covered several different areas related to the application of various substances to crops and soils.

The first experiment studied the influence of four salts on wheat plants. Zinc and copper salts were found to be stimulating at low levels, but toxic as larger applications were applied. When manganese and cerium salts were added to wheat, no significant change was found in plant growth or plant yield.

The second experiment compared lime to magnesium in soils. These studies showed that a higher ratio of lime to magnesium in the soil was beneficial to plants whereas a lower lime ratio was detrimental.

The third experiment analyzed sulfur as a fertilizer which resulted in no significant effects on the growth of a variety of crops.

The final study consisted of determining the effects of lithium phosphate and magnesia on the tomato plant. Both substances when added to the soil were found to be toxic to the plants used.

REFERENCE: Journal Royal Agr. Soc. (England), 1913, pp. 411-422.

For articles on related subject see Nos. 109, 777, and 802.

814. PREDICTED BIOCONCENTRATION FACTORS AND SOIL SORPTION COEFFICIENTS OF PESTICIDES AND OTHER CHEMICALS

by

Eugene E. Kenaga

To calculate soil sorption, equations were used on the coefficients and bioconcentration components including 358 compounds. Pesticides were measured mostly from known water values. Experiments were done for the highest values of bioconcentration factors that could be calculated, and values were possible to find. The highest value of bioconcentration factors was found in chemicals retaining water solubility of less than 0.1 ppm. In comparison, the coefficients are also located in low water solubility. Some 10% of the bioconcentration factor values exceeded 1000, and in order to find the environmental importance, it should be experimentally confirmed. Thirty percent of the coefficients were also over 1000. To calculate the values in water is a simple situation that is useful for estimation of partitioning in soil and in animal tissues. This is good in order of possible prevention of potential hazards. In conclusion, the low solubility in water prevents a good indication between insecticides and herbicides.

REFERENCE: Ecotoxicology and Environmental Safety, Vol. 4, 1980, pp. 26-38.

815. A RAPID METHOD OF EVALUATING DIFFERENT COMPOUNDS AS INHIBITORS OF UREASE ACTIVITY IN SOILS

by

L. A. Douglas and J. M. Bremner

This method involves determining the extent to which a test compound will inhibit urease activity in a soil sample. The extent is evaluated by colormetric determination, and the method can be adapted to study the rate of inactivation of urease inhibitors in soils.

REFERENCE: Soil Biol. Biochem., Vol. 3, No. 4, 1971, pp. 309-316.

816. WASTE WATER RENOVATION THROUGH SOIL PERCOLATION

by

Matt K. John

A study was done on effluent renovation by soil percolation. This involves the leaching of secondary effluent through three differing soil types: fluvial deposited soil, glacial lake-shore soil, and marine deposited soil. Analyses in 22 leachate collections showed that the influence of varying soil properties, and the effects of continuous use were the mechanisms of the removal of phosphorus. Renovations of effluent phosphorus occurred most with percolation through acidic Milner soils (marine deposited) which are high in aluminum and iron. Squilex soil (fluvial) removed more phosphorus from the first leachings due to its higher exchangeable calcium content. Over a long term, Glenmore soil (glacial lakeshore) proved to be the better of these two alkaline soils. Levels of leachate NO_3-N were found to be lower than original NO_3-N effluent. Through all three soils, NO_3-N enrichment lasted during effluent percolations. Cations that accumulated caused effluent concentrations to lower in the Milner soils.

REFERENCE: Water, Air, and Soil Pollution, Vol. 3, 1974, pp. 3-10.

For articles on related subject see Nos. 126, 208, 404, 427, and 515.

817. AERIAL PHOTOGRAPHY ASSISTS ARMY SEARCH FOR HAZARDOUS WASTES

The U.S. Army is utilizing aerial photography to supplement their search for hazardous waste sights which the army has left behind in the past. Aerial photographs are used in conjunction with historical imagery; other governmental archives and army records are in search for these sites. Magnified steroscopic viewing and photo enlargements are some techniques used to make identification of various objects of areas easier. This method provides an alternative for determining specific areas of potential danger which cannot easily be determined from the ground.

REFERENCE: EPA, October 1982, pp. 1-4.

818. AERIAL PHOTOGRAPHY FOR EMERGENCY RESPONSE

This report discusses the use of aerial photography for emergency response. The EPA's Environmental Monitoring Systems Laboratory helps the Agency in providing photography services around the clock to EPA response teams in the emergency areas of a chemical fire and spills of hazardous substances into the environment. Aerial photography provides a quick overview of the existing problem; they are tailored to the specific needs of each incident. A study of aerial photographys shows information on conditions at the site such as the location and extent of visible spillage, vegetation damage, and potential transport of chemicals via drainage conduits. Aerial photographs also provide information of safety planning, including population evacuation and reoccupancy and determination of a control area.

REFERENCE: EPA, December 1982, pp. 1-3.

819. AERIAL PHOTOGRAPHY HELPS ASSESS SEPTIC SYSTEMS

Aerial photography can be used in assessing failures in septic systems. Aerial photographs are taken with color and infrared cameras, then studied under powerful stereoscoptic techniques. An analyst using these techniques can pin-point the indicators of septic system failures. False indicators that do not correspond to system failure can also be distinguished.

REFERENCE: EPA, 1982, pp. 1-4.

820. AERIAL PHOTOGRAPHY TO SUPPORT CHEMICAL EXPOSURE ASSESSMENTS

This paper discusses the use of aerial photography to support chemical exposure assessments. Aerial photography has been used in studies on the environmental impact of industrial facilities, coal extraction, septic tank failures, hazardous waste sites, and wetlands development. They are also using aerial photography to improve approaches to monitoring air, water, soil, food, and other environmental pathways in order to assess the degree and extent of chemical exposures to man. Aerial photography has been used before in projects such as pollutant leakage into waterways or aquifers used for drinking water supplies and the proximity of pollutions to chemical spills and explosions. But recently, efforts are being made to link aerial photography capabilities in a systematic manner with the design of exposure monitoring networks. Several ways in aerial photography have already proven to be an extremely useful and cost-reducing tool in efforts to monitor our exposure to toxic chemicals in our environment.

REFERENCE: EPA, October 1981, pp. 1-4.

821. AIRBORNE REMOTE SENSING

by

Glenn E. Schweitzer

Three types of airborne surveying are described: multispectral scanning, lasers survey, and aerial photography. Multispectral scanning records radiant energy reflected by the ground surface that has been split into 11 different wave lengths corresponding to ultraviolet through infrared on the electromagnetic spectrum. Laser fluorosensing records the intensity of laser induced fluorescence, which is directly proportional to the concentration of chlorophyll-a or dissolved organic carbon in the surface layers of a body of water. Laser "liders" record time delays between laser firing and the return of back-scattered light from laser pulse interaction with airborne particles and droplets in an aerosol layer. Aerial photography can be used to identify hazardous waste sites and contamination of areas by hazardous materials.

REFERENCE: Environmental Science & Technology, Vol. 16, No. 6, 1982, pp. 338a-346a.

822. SEEING IS BELIEVING

This paper discusses the use of an instrument called Enviro-Pad for aerial photographic imagery. The device consists of two cameras set at different angles which are designed for mounting on light aircraft. The device provides an efficient means by which information on waste disposal areas can be obtained. This instrument produces economical, high-resolution images of the desired area. Use of these instruments can be arranged by state or local officials in cooperation with the EPA.

REFERENCE: EPA, 600/4-82-056, July 1982, pp. 1-4.

823. USING AERIAL PHOTOGRAPHY FOR LOCATING AND INVESTIGATING HAZARDOUS WASTE SITES

This report discusses the use of aerial photography of hazardous waste sites. This imagery is used to locate and describe various waste sites. Aerial photographs are used to supplement other sources of information including historical photographs and data. Classifications are made from this information into such categories as liquid waste disposal sight, active landfills, and unidentifiable scars. Emphasis is made on potential dangers to residences and the environment. Aerial photography provides an efficient means of documenting a wide variety of data on waste disposal sites.

REFERENCE: EPA, September 1981, pp. 1-4.

824. THE FLUCTUATION TEST AS A MORE SENSITIVE SYSTEM FOR DETERMINING INDUCED MUTATION IN L5178Y MOUSE LYMPHOMA CELLS

by

J. Cole et al.

To analyse spontaneous mutation and the rates involved, a series of Luria-Delbruck Fluctuation tests were run. These tests were done in order to compare Ouabain negativity and mouse lymphoma cells of a mouse. In doing the Fluctuation testing, it was found more sensitive and easier to compare mutagens than most other tests.

REFERENCE: Mutation Research, Vol. 41, 1976, pp. 377-386.

For articles on related subject see No. 254, 731, and 732.

825. POINT MUTATIONS INDUCED BY PHARMACEUTICAL DRUGS

by

A. Carere

A test was undertaken to determine the mutagenic effects of pharmaceutical drugs. The technique used was a "plate test" in which the suspected substance is added to a sample of the chosen bacteria. Results showed six out of about one hundred of the drugs tested to be mutagenic. In subsequent tests, however, results varied.

REFERENCE: Mutation Research, Vol. 29, 1975, p. 235.

For articles on related subject see Nos. 60, 478, and 733.

826. RECENT DEVELOPMENTS WITH L5178Y TK HETEROZYGOTE MUTAGEN ASSAY SYSTEM

by

Donald Clive

The mammalian cell culture system helps bring together the gulf between microbial systems and whole mammal systems that have been used in mutagenical studies. Lymphoma cells have been known to retain both mammalian architecture and certain parts of mammalian metabolism. An interesting quality of mutagenesis is they emphasize classification as being strong, weak, or of intermediate potency mutagens. Various hycanthone analogs are being studied, one of which has put forth possible negligible mutagenicity at levels inhibiting growth. Tests are in the process of finding new and safe hycanthone substitutes for use in the control of schistosmiasis. Mutagens do not attack in single file but en masse; target cells not being intraperitoneal, but gonadal. Here the issue is not only dead fetuses, but an imperceptably debilitating numbers, and where Salmonella sapiens do not exist.

REFERENCE: Environmental Health Perspectives, Vol. 6, 1973, pp. 119-125.

827. THE SELECTION AND INDUCTION OF 5-IODO-2-DEOXYURIDINE AND THYMIDINE VARIANTS OF P388 MOUSE LYMPHOMA CELLS WITH AGENTS WHICH ARE USED FOR SELECTION

by

Diana Anderson

5-IODO-2-Deoxyuridine (IUdR), 5-BROMO-2-Deoxyuridine (BUdR), azaguanine, and pyrimidine thymidine (TdR) have been used to select the variant cells of mammals that were previously treated with suspected mutagens. Recent observation and study has revealed that to extend these selective agents may act as mutagens, thus increasing the frequency of variants, or decreasing the frequency of variants due to non-survival of doubly injured cells. This phenonmenon could involve the metabolic pathways used by a variety of agents and correspondance between paths used by mutagens or selectors.

REFERENCE: Mutation Research, Vol. 33, 1975, pp. 399-406.

828. ENVIRONMENTAL CHANGES FROM LONG-TERM LAND APPLICATION OF MUNICIPAL EFFLUENTS

by

T. D. Hinesly et al.

This report contains the results of various chemical analyses performed on soil and plant samples collected from sewage effluent disposal sites during March 1975 at Bakersfield, California and at Lubbock, Texas in June 1976. At both sites approximately 16 mgd of effluent is applied daily throughout the year on land used for the production of row and forage crops. Parts of both farms have been annually irrigated with sewage effluent for more than 35 years. Except for changes in phosphorus concentrations, soil chemical properties were not markedly affected by sewage effluent irrigations. Long-term irrigations with sewage effluent have caused very little change in the chemical composition of plants grown on the disposal sites.

From the few data available, it appears that long-term disposal of sewage effluent on farm land may have caused unacceptable concentrations of nitrates in groundwaters. This problem could be easily corrected at both sites by storing effluent during winter months. With adequate storage facilities, effluent applications could be regulated so that nitrogen inputs were in balance with nitrogen uptake by crop plants. If they were managed to remove nitrogen, soils at both sites have potential capacities for removing contaminants from wastewaters for many more years.

REFERENCE: EPA, 430/9-78-003, June 1978, pp. 1-31.

For articles on related subject see Nos. 1, 65, 714, 731, and 733.

829. LONG-TERM EFFECTS OF LAND APPLICATION OF DOMESTIC WASTEWATER: HOLLISTER, CALIFORNIA, RAPID INFILTRATION SITE

by

Charles E. Pound et al.

After a one year sampling and analysis program period, the rapid infiltration treatment technique in use at this site was found to be effectively reducing: chemical oxygen demand, biochemical oxygen demand, total oxygen demand, nitrogen, and fecal coliform. Trace elements were not removed as well as other effluent constituents, but only lead exceeded drinking water limits for waste water and for shallow groundwater aquifer. Full project, operations, and analyses descriptions are included.

REFERENCE: EPA-600/2-79-084, 1978, pp. 1-149.

For articles on related subject see Nos. 67, 75, 79, and 739.

830. RECENT DEVELOPMENTS WITH L5178Y TK HETEROZYGOTE MUTAGEN ASSAY SYSTEM

by

Donald Clive

The mammalian cell culture system helps bring together the gulf between microbial systems and whole mammal system that have been used in mutagenical studies. Lymphoma cells have been known to retain both mammalian architecture and certain parts of mammalian metabolism. An interesting quality of mutagenesis is they emphasize classification as being strong, weak, or of intermediate potency mutagens. Various hycanthone analogs are being studied, one of which has put forth possible negligible mutagenicity at levels inhibiting growth. Tests are in the process of finding new and safe hycanthone substitutes for use in the control of schistosmiasis. Mutagens do not attack in single file but en masse; target cells not being intraperitoneal, but gonadal. Here the issue is not only dead fetuses, but an imperceptably debilitating numbers, and where Salmonella sapiens do not exist.

REFERENCE: Environmental Health Perspectives, Vol. 6, 1973, pp. 119-125.

For articles on related subject see Nos. 91, 100, 102, 103, 108, 112, 113, 109, and 825.

831. THE SELECTION AND INDUCTION OF 5-IODO-2-DEOXYURIDINE AND THYMIDINE VARIANTS OF P388 MOUSE LYMPHOMA CELLS WITH AGENTS WHICH ARE USED FOR SELECTION

by

Diana Anderson

5-IODO-2-Deoxyuridine (IUdR), 5-BROMO-2-Deoxyuridine (BUdR), azaguanine, and pyrimidine thymidine (TdR) have been used to select the variant cells of mammals that were previously treated with suspected mutagens. Recent observation and study has revealed that to extend these selective agents may act as mutagens, thus increasing the frequency of variants, or decreasing the frequency of variants due to non-survival of doubly injured cells. This phenonmenon could involve the metabolic pathways used by a variety of agents and correspondance between paths used by mutagens or selectors.

REFERENCE: Mutation Research, Vol. 33, 1975, pp. 399-406.

For articles on related subject see Nos. 115 and 117.

832. COST COMPARISONS OF TREATMENT AND DISPOSAL ALTERNATIVES FOR HAZARDOUS WASTES--VOLUME I

by

Warren G. Aansen and Howard L. Rishel

Unit costs are estimated for 16 treatment and 5 disposal techniques applicable to hazardous wastes from the organic chemicals, inorganic chemicals, and electroplating and metal finishing industries. Each technology was evaluated by unit process or modules, and computer-linked models developed for calculating capital and operating costs at the unit process level. Costs were aggregated at the technology level including applicable indirect costs and maintenance costs. Data files were designed to indicate economies of scale for 5 levels of through put. Life cycle average unit costs are presented in both tabular and graphic form.

REFERENCE: EPA-600/2-80-188, December 1980.

For articles on related subject see Nos. 132 and 133.

833. PLANNING FOR LAND-BASED WASTE MANAGEMENT SYSTEMS: SOME ECONOMIC AND INSTITUTIONAL CONSIDERATIONS

by

Maurice Baker and Lee A. Christensen

The use of air and water for disposal of wastes from production and consumption is no longer acceptable. One of the alternative means of disposal is land disposal. Decisions concerning utilization and disposition of residual wastes is influenced by a large number of variables.

This article discusses the economics related to waste management in terms of cost analyses, externalities, government actions, materials flow, joint products, and stock and flow resources. Means for attaining environmental goals are by a legal-regulatory approach and an economic incentive approach. Opportunity costs will influence whether a residual will be used in a production process. Some objectives of land application are minimizing waste treatment costs, disposing of wastes in an environmentally acceptable manner supplying nutrient or water requirements of crops and recharging ground aquifers. Some options for institutional structures discussed are acquisition and management options, fee simple acquisition, less than simple and contractual agreements. There is a long discussion of a decision framework for considering land application and a discussion of cost of land application systems.

REFERENCE: Land Application of Waste Materials Soil Cons. Soc. of America, pp. 278-288.

For articles on related subject see Nos. 71, 83, 87, and 391.